

A STREET & SMITH PUBLICATION

# ASTOUNDING

## STORIES

MARCH  
20¢

PROXIMA  
CENTAURI

by  
*Murray Leinster*



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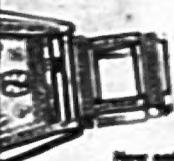
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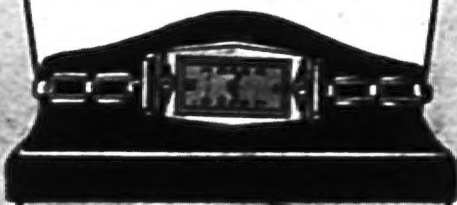
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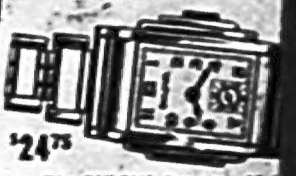


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VOLUME XV  
NUMBER 1

# ASTOUNDING STORIES

MARCH  
1935

A STREET & SMITH PUBLICATION

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Single Copy, 20 Cents

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Monthly publications issued by Street & Smith Publications, Inc., 75 2d Avenue, New York, N. Y. General C. Smith, Jr., President, General V. Smith, Vice President and Treasurer; Arthur H. Brown, Vice President and Secretary; Charles C. Vernon, Vice President. Copyright, 1935, by Street & Smith Publications, Inc., New York. Copyright, 1935, by Street & Smith Publications, Inc., Great Britain. Entered as Second-Class Matter September 15, 1935, at the Post Office at New York, N. Y., under Act of Congress of March 3, 1879. Subscriptions in Cash, Foreign, Europe, Africa, India, Australia, and South America, \$2.00 per year. The German and British Editions, \$2.75 per year. We do not accept responsibility for the return of unsolicited manuscripts.

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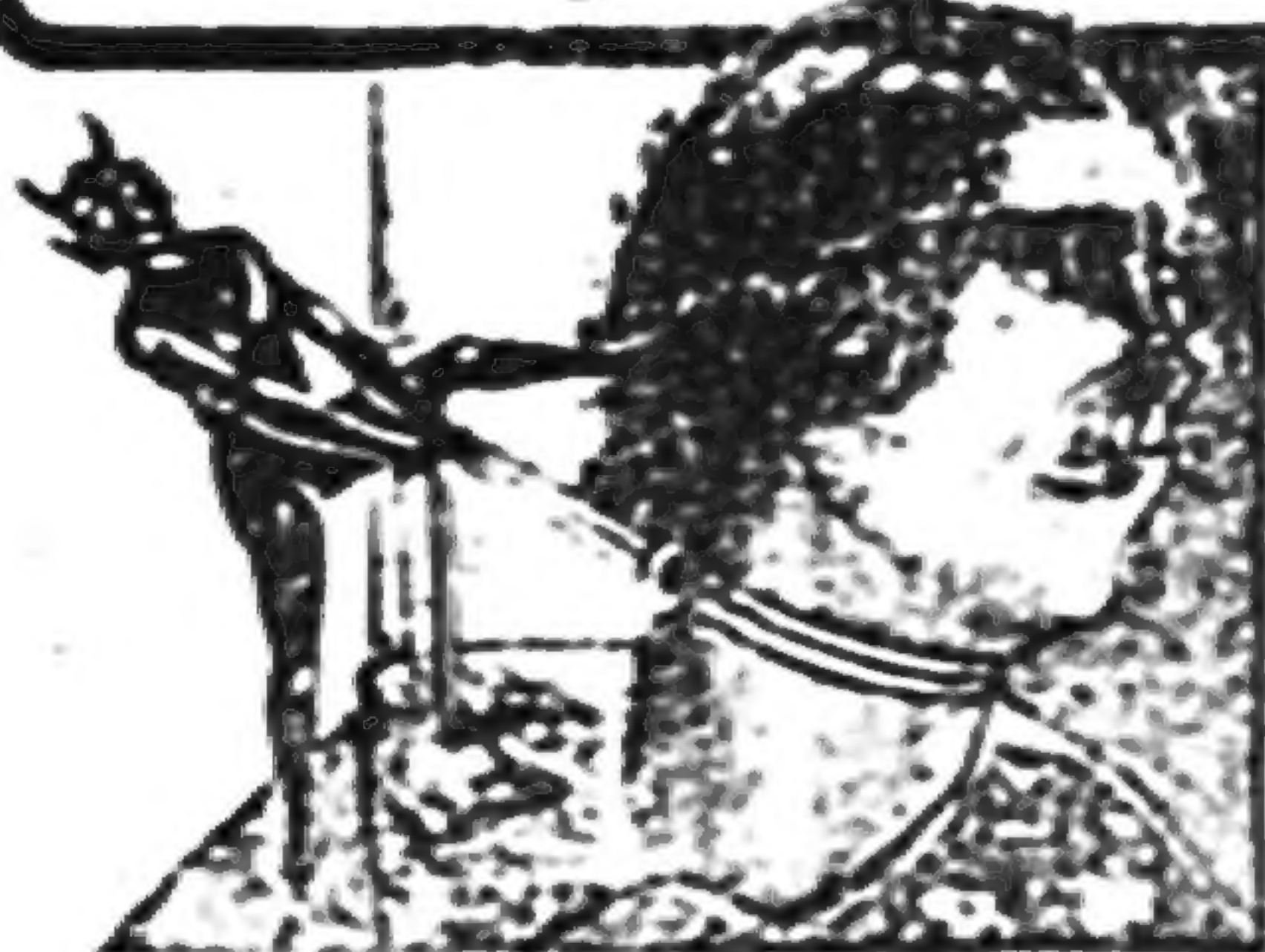
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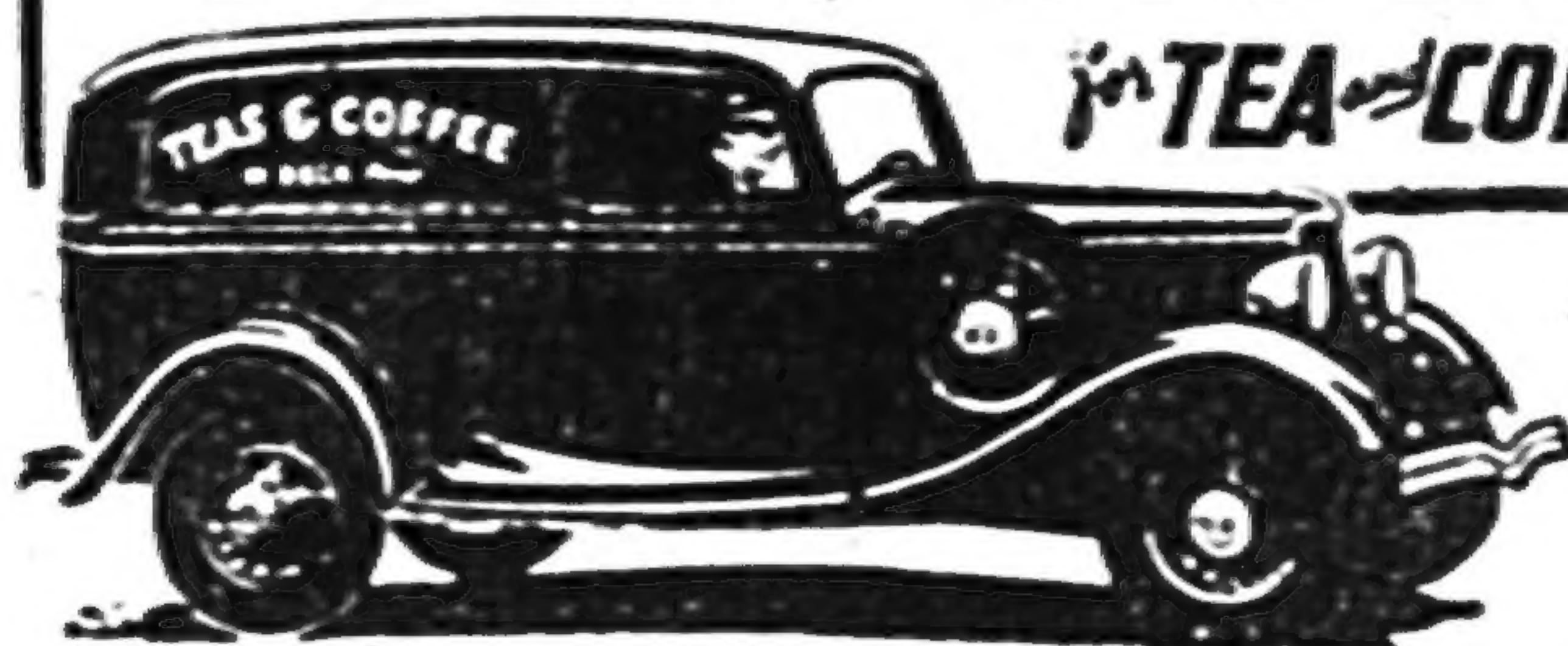
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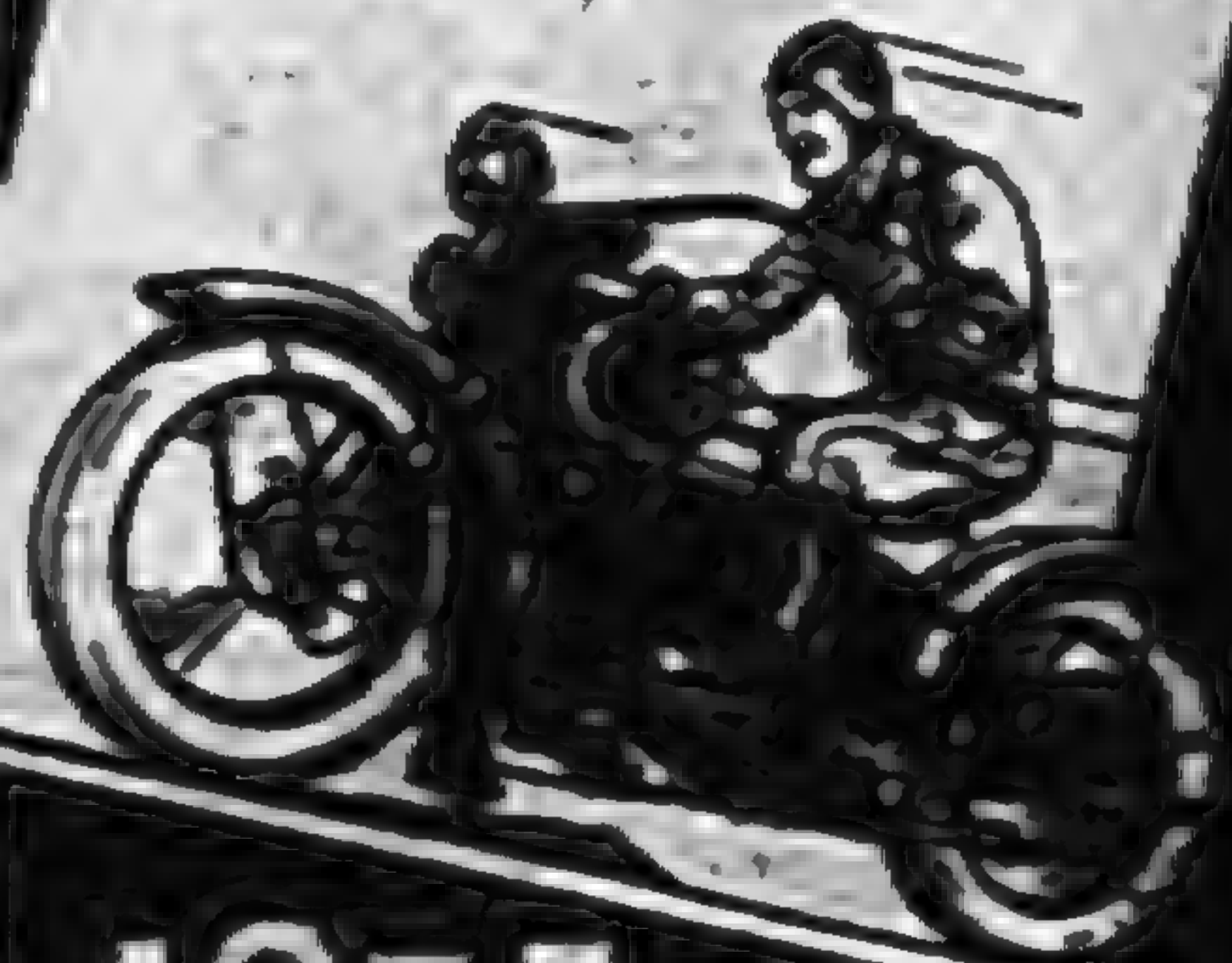
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# Proxima Centauri

*A tale of the galaxies—that could come only from the pen of a favorite. You will live it with the thrills of an adventurer*

**by Murray Leinster**

*Illustrated by Elliott Dold, Jr.*





*From every side grim-lipped faces peered,  
eyes squinted along telescopic sights.*

**T**HE ADASTRA, from a little distance, already shone in the light of the approaching sun. The vision disks which scanned the giant space ship's outer skin relayed a faint illumination to the visiplates within. They showed the monstrous, rounded bulk of the metal globe, crisscrossed

with girders too massive to be transported by any power less than that of the space ship itself. They showed the whole, five-thousand-foot globe as an ever so faintly glowing object, seemingly motionless in mid-space.

In that seeming, they lied. Monstrous as the ship was, and apparently

too huge to be stirred by any conceivable power, she was responding to power now. At a dozen points upon her faintly glowing side there were openings. From those openings there flowed out tenuous purple flames. They gave little light, those flames—less than the star ahead—but they were the disintegration blasts from the rockets which had lifted the *Adastria* from the surface of Earth and for seven years had hurled it on through interstellar space toward Proxima Centauri, nearest of the fixed stars to humanity's solar system.

Now they hurled it forward no more. The mighty ship was decelerating. Thirty-two and two-tenths feet per second, losing velocity at the exact rate to taintain the effect of Earth's gravity within its bulk, the huge globe showed. For months braking had been going on. From a peak-speed measurably near the velocity of light, the first of all vessels to span the distance between two solar systems had slowed and slowed, and would reach a speed of maneuver some sixty million miles from the surface of the star.

Far, far ahead, Proxima Centauri glittered invitingly. The vision disks that showed its faint glow upon the space ship's hull had counterparts which carried its image within the hull, and in the main control room it appeared enlarged very many times. An old, white-bearded man in uniform regarded it meditatively. He said slowly, as if he had said the same thing often before:

"Quaint, that ring. It is double, like Saturn's. And Saturn has nine moons. One wonders how many planets this sun will have."

The girl said restlessly: "We'll find out soon, won't we? We're almost there. And we already know the rotation period of one of them! Jack said that——"

Her father turned deliberately to her. "Jack?"

"Gary," said the girl. "Jack Gary."

"My dear," said the old man mildly. "He seems well-disposed, and his abilities are good, but he is a Mut. Remember!"

The girl bit her lip.

The old man went on, quite slowly and without rancor: "It is unfortunate that we have had this division among the crew of what should have been a scientific expedition conducted in the spirit of a crusade. You hardly remember how it began. But we officers know only too well how many efforts have been made by the Muts to wreck the whole purpose of our voyage. This Jack Gary is a Mut. He is brilliant, in his way. I would have brought him into the officers' quarters, but Alstair investigated and found undesirable facts which made it impossible."

"I don't believe Alstair!" said the girl evenly. "And, anyhow, it was Jack who caught the signals. And he's the one who's working with them, officer or Mut! And he's human, anyhow. It's time for the signals to come again and you depend on him to handle them."

The old man frowned. He walked with a careful steadiness to a seat. He sat down with an old man's habitual and rather pathetic caution. The *Adastria*, of course, required no such constant vigilance at the controls as the interplanetary space ships require. Out here in emptiness there was no need to watch for meteors, for traffic, or for those queer and yet inexplicable force fields which at first made interplanetary flights so hazardous.

The ship was so monstrous a structure, in any case, that the tinier meteorites could not have harmed her. And at the speed she was now making greater ones would be notified by the induction fields in time for observation and if necessary the changing of her course.

A DOOR at the side of the control room opened briskly and a man stepped in. He glanced with conscious professionalism at the banks of indicators. A relay clicked, and his eyes darted to the spot. He turned and saluted the old man with meticulous precision. He smiled at the girl.

"Ah, Alstair," said the old man. "You are curious about the signals, too?"

"Yes, sir. Of course! And as second in command I rather like to keep an eye on signals. Gary is a Mut, and I would not like him to gather information that might be kept from the officers."

"That's nonsense!" said the girl hotly.

"Probably," agreed Alstair. "I hope so. I even think so. But I prefer to leave out no precaution."

A buzzer sounded. Alstair pressed a button and a vision plate lighted. A dark, rather grim young face stared out of it.

"Very well, Gary," said Alstair curtly.

He pressed another button. The vision plate darkened and lighted again to show a long corridor down which a solitary figure came. It came close and the same face looked impassively out. Alstair said even more curtly:

"The other doors are open, Gary. You can come straight through."

"I think that's monstrous!" said the girl angrily as the plate clicked off. "You know you trust him! You have to! Yet every time he comes into officers' quarters you act as if you thought he had bombs in each hand and all the rest of the men behind him!"

Alstair shrugged and glanced at the old man, who said tiredly:

"Alstair is second in command, my dear, and he will be commander on the way back to Earth. I could wish you would be less offensive."

But the girl deliberately withdrew her eyes from the brisk figure of Alstair

with its smart uniform, and rested her chin in her hands to gaze broodingly at the farther wall. Alstair went to the banks of indicators, surveying them in detail. The ventilator hummed softly. A relay clicked with a curiously smug, self-satisfied note. Otherwise there was no sound.

The *Adastra*, mightiest work of the human race, hurtled on through space with the light of a strange sun shining faintly upon her enormous hull. Twelve lambent purple flames glowed from holes in her forward part. She was decelerating, lessening her speed by thirty-two point two feet per second per second, maintaining the effect of Earth's gravity within her bulk.

Earth was seven years behind and uncounted millions of billions of miles. Interplanetary travel was a commonplace in the solar system now, and a thriving colony on Venus and a precariously maintained outpost on the largest of Jupiter's moons promised to make space commerce thrive even after the dead cities of Mars had ceased to give up their incredibly rich loot. But only the *Adastra* had ever essayed space beyond Pluto.

She was the greatest of ships, the most colossal structure ever attempted by men. In the beginning, indeed, her design was derided as impossible of achievement by the very men who later made her building a fact. Her framework beams were so huge that, once cast, they could not be moved by any lifting contrivance at her builders' disposal. Therefore the molds for them were built and the metal poured in their final position as a part of the ship. Her rocket tubes were so colossal that the necessary supersonic vibrations—to neutralize the disintegration effect of the Caldwell field—had to be generated at thirty separate points on each tube, else the disintegration of her fuel would have spread to the tubes themselves and the big ship afterward, with even the

mother planet following in a burst of lambent purple flame. At full acceleration a set of twelve tubes disintegrated five cubic centimeters of water per second.

Her diameter was a shade over five thousand feet. Her air tanks carried a reserve supply which could run her crew of three hundred for ten months without purification. Her stores, her shops, her supplies of raw and finished materials, were in such vast quantities that to enumerate them would be merely to recite meaningless figures.

There were even four hundred acres of food-growing space within her, where crops were grown under sun lamps. Those crops used waste organic matter as fertilizer and restored exhaled carbon dioxide to use, in part as oxygen and in part as carbohydrate foodstuffs.

The *Adastra* was a world in herself. Given power, she could sustain her crew forever, growing her food supplies, purifying her own internal atmosphere without loss and without fail, and containing space within which every human need could be provided, even solitude.

And starting out upon the most stupendous journey in human history, she had formally been given the status of a world, with her commander empowered to make and enforce all needed laws. Bound for a destination four light-years distant, the minimum time for her return was considered to be fourteen years. No crew could possibly survive so long a voyage undecimated. Therefore the enlistments for the voyage had not been by men, but by families.

There were fifty children on board when the *Adastra* lifted from Earth's surface. In the first year of her voyage ten more were born. It had seemed to the people of Earth that not only could the mighty ship sustain her crew forever, but that the crew itself, well-nourished and with more than adequate facilities both for amusement and education, could so far perpetuate itself as to make

a voyage of a thousand years as practicable as the mere journey to Proxima Centauri.

AND SO it could, but for a fact at once so needless and so human that nobody anticipated it. The fact was tedium. In less than six months the journey had ceased to become a great adventure. To the women in particular, the voyage of the big ship became deadly routine.

The *Adastra* itself took on the semblance of a gigantic apartment house without newspapers, department stores, new film plays, new faces, or even the relieving annoyances of changeable weather. The sheer completeness of all preparations for the voyage made the voyage itself uneventful. That meant tedium.

Tedium meant restlessness. And restlessness, with women on board who had envisioned high adventure, meant the devil to pay. Their husbands no longer appeared as glamorous heroes. They were merely human beings. The men encountered similar disillusionments. Pleas for divorce flooded the commander's desk, he being legally the focus of all legal action. During the eighth month there was one murder, and in the three months following, two more.

A year and a half out from Earth, and the crew was in a state of semi-mutiny originating in sheer boredom. By two years out, the officers' quarters were sealed off from the greater part of the *Adastra's* interior, the crew was disarmed, and what work was demanded of the mutineers was enforced by force guns in the hands of the officers. By three years out, the crew was demanding a return to Earth. But by the time the *Adastra* could be slowed and stopped from her then incredible velocity, she would be so near her destination as to make no appreciable difference in the length of her total voyage! For the rest



of the time the members of the crew strove to relieve utter monotony by such vices and such pastimes as could be improvised in the absence of any actual need to work.

The officers' quarters referred to the underlings by a term become habitual, a contraction of the word "mutineers." The crew came to have a queer distaste for all dealing with the officers. But, despite Alstair, there was no longer much danger of an uprising. A certain mental equilibrium had—very late—developed.

From the nerve-racked psychology of dwellers in an isolated apartment house, the greater number of the *Adastra's* complement came to have the psychology of dwellers in an isolated village. The difference was profound. In particular the children who had come to maturity, during the long journey through space were well-adjusted to the conditions of isolation and of routine.

Jack Gary was one of them. He had been sixteen when the trip began, son of a rocket-tube engineer whose death took place the second year out. Helen Bradley was another. She had been fourteen when her father, as designer and commanding officer of the mighty globe, pressed the control key that set the huge rockets into action.

Her father had been past maturity at the beginning. Aged by responsibility for seven uninterrupted years, he was an old man now. And he knew, and even Helen knew without admitting it, that he would never survive the long trip back. Alstair would take his place and the despotic authority inherent in it, and he wanted to marry Helen.

She thought of these things, with her chin cupped in her hand, brooding in the control room. There was no sound save the humming of the ventilator and the infrequent smug click of a relay operating the automatic machinery to keep the *Adastra* a world in which nothing ever happened.

A knock on the door. The commander opened his eyes a trifle vaguely. He was very old now, the commander. He had dozed.

Alstair said shortly, "Come in!" and Jack Gary entered.

He saluted, pointedly to the commander. Which was according to regulations, but Alstair's eyes snapped.

"Ah, yes," said the commander. "Gary. It's about time for more signals, isn't it?"

"Yes, sir."

Jack Gary was very quiet, very businesslike. Only once, when he glanced at Helen, was there any hint of anything but the formal manner of a man intent on his job. Then his eyes told her something, in an infinitely small fraction of a second, which changed her expression to one of flushed content.

Short as the glance was, Alstair saw it. He said harshly:

"Have you made any progress in deciphering the signals, Gary?"

Jack was setting the dials of a pan-wave receptor, glancing at penciled notes on a calculator pad. He continued to set up the reception pattern.

"No, sir. There is still a sequence of sounds at the beginning which must be a form of call, because a part of the same sequence is used as a signature at the close. With the commander's permission I have used the first part of that call sequence as a signature in our signals in reply. But in looking over the records of the signals I've found something that looks important."

The commander said mildly: "What is it, Gary?"

"We've been sending signals ahead of us on a tight beam, sir, for some months. Your idea was to signal ahead, so that if there were any civilized inhabitants on planets about the sun, they'd get an impression of a peaceful mission."

"Of course!" said the commander. "It would be tragic for the first of in-

terstellar communications to be unfriendly?"

"We've been getting answers to our signals for nearly three months. Always at intervals of a trifle over thirty hours. We assumed, of course, that a fixed transmitter was sending them, and that it was signaling once a day when the station was in the most favorable position for transmitting to us."

"Of course," said the commander gently. "It gave us the period of rotation of the planet from which the signals come."

JACK GARY set the last dial and turned on the switch. A low-pitched hum arose, which died away. He glanced at the dials again, checking them.

"I've been comparing the records, sir, making due allowance for our approach. Because we cut down the distance between us and the star so rapidly, our signals to-day take several seconds less to reach Proxima Centauri than they did yesterday. Their signals should show the same shortening of interval, if they are actually sent out at the same instant of planetary time every day."

The commander nodded benevolently.

"They did, at first," said Jack. "But about three weeks ago the time interval changed in a brand-new fashion. The signal strength changed, and the wave form altered a little, too, as if a new transmitter was sending. And the first day of that change the signals came through one second earlier than our velocity of approach would account for. The second day they were three seconds earlier, the third day six, the fourth day ten, and so on. They kept coming earlier by a period indicating a linear function until one week ago. Then the rate of change began to decrease again."

"That's nonsense!" said Alstair harshly.

"It's records," returned Jack curtly.

"But how do you explain it, Gary?" asked the commander mildly.

"They're sending now from a space ship, sir," replied Jack briefly, "which is moving toward us at four times our maximum acceleration. And they're flashing us a signal at the same interval, according to their clocks, as before."

A pause. Helen Bradley smiled warmly. The commander thought carefully. Then he admitted:

"Very good, Gary! It sounds plausible. What next?"

"Why, sir," said Jack, "since the rate of change shifted, a week ago, it looks as if that other space ship started to decelerate again. Here are my calculations, sir. If the signals are sent at the same interval they kept up for over a moment, there is another space ship headed toward us, and she is decelerating to stop and reverse and will be matching our course and speed in four days and eighteen hours. They'll meet and surprise us, they think."

The commander's face lighted up. "Marvelous, Gary! They must be far advanced indeed in civilization! Inter-course between two such peoples, separated by four light-years of distance! What marvels we shall learn! And to think of their sending a ship far beyond their own system to greet and welcome us!"

Jack's expression remained grim.

"I hope so, sir," he said dryly.

"What now, Gary?" demanded Alstair angrily.

"Why," said Jack deliberately, "they're still pretending that the signals come from their planet, by signaling at what they think are the same times. They could exchange signals for twenty-four hours a day, if they chose, and be working out a code for communication. Instead, they're trying to deceive us. My guess is that they're coming at least prepared to fight. And if I'm right,

their signals will begin in three seconds, exactly."

He stopped, looking at the dials of the receptor. The tape which photographed the waves as they came in, and the other which recorded the modulations, came out of the receptor blank. But suddenly, in just three seconds, a needle kicked over and tiny white lines appeared on the rushing tapes. The speaker uttered sounds.

It was a voice which spoke. So much was clear. It was harsh yet sibilant, more like the stridulation of an insect than anything else. But the sounds it uttered were modulated as no insect can modulate its outcry. They formed what were plainly words, without vowels or consonants, yet possessing expression and varying in pitch and tone quality.

The three men in the control room had heard them many times before, and so had the girl. But for the first time they carried to her an impression of menace, of threat, of a concealed lust for destruction that made her blood run cold.

## II.

THE SPACE SHIP hurtled on through space, her rocket tubes scolding forth small and apparently insufficient purple flames which emitted no smoke, gave off no gas, and were seemingly nothing but small marsh fires inexplicably burning in emptiness.

There was no change in her outer appearance. There had been none to speak of in years. At long, infrequent intervals men had emerged from air locks and moved about her sides, bathing the steel they walked on and themselves alike with fierce-glazes from heat lamps lest the cold of her plating transmit itself through the material of the suits and kill the men like ants on red-hot metal. But for a long time no such expedition had been needed.

Only now, in the distant faint light of Proxima Centauri, a man in a space

suit emerged from such a tiny lock. Instantly he shot out to the end of a threadlike life line. The constant deceleration of the ship not only simulated gravity within. Anything partaking of its motion showed the same effect. The man upon its decelerating forward side was, flung away from the ship by his own momentum, the same force which, within it, had pressed his feet against the floors.

He hauled himself back laboriously, moving with an exaggerated clumsiness in his bloated space suit. He clung to handholds and hooked himself in place, while he worked an electric drill. He moved still more clumsily to another place and drilled again. A third, and fourth, and fifth. For half an hour or more, then, he labored to set up on the vast steel surface, which seemed always above him, an intricate array of wires and framework. In the end he seemed content. He hauled himself back to the air lock and climbed within. The *Adastros* hurtled onward, utterly unchanged save for a very tiny fretwork of wire, perhaps thirty feet across, which looked more like a microscopic barbed-wire entanglement than anything else.

Within the *Adastros*, Helen Bradley greeted Jack warmly as he got out of his space suit.

"It was horrible!" she told him, "to see you dangling like that! With millions of miles of empty space below you!"

"If my line had parted," said Jack quietly, "your father'd have turned the ship and caught up to me. Let's go turn on the inductor and see how the new reception grid works."

He hung up the space suit. As they turned to go through the doorway their hands touched accidentally. They looked at each other and faltered. They stopped, Helen's eyes shining. They all unconsciously swayed toward each other. Jack's hands lifted hungrily.

Footsteps sounded close by. Alstair, second in command of the space ship, rounded a corner and stopped short.

"What's this?" he demanded savagely. "Just because the commander's brought you into officers' quarters, Gary, it doesn't follow that your Mut methods of romance can come, too!"

"You dare!" cried Helen furiously.

Jack, from a hot dull flush, was swiftly paling to the dead-white of rage.

"You'll take that back," he said very quietly indeed, "or I'll show you Mut methods of fighting with a force gun! As an officer, I carry one, too, now!"

Alstair snarled at him.

"Your father's been taken ill," he told Helen angrily. "He feels the voyage is about over. Anticipation has kept up his strength for months past, but now he's——"

With a cry, the girl fled.

Alstair swung upon Jack. "I take back nothing," he snapped. "You're an officer, by order of the commander. But you're a Mut besides, and when I'm commander of the *Adastra* you don't stay an officer long! I'm warning you! What were you doing here?"

Jack was deathly pale, but the status of officer on the *Adastra*, with its consequent opportunity of seeing Helen, was far too precious to be given up unless at the last extremity. And, besides, there was the work he had in hand. His work, certainly, could not continue unless he remained an officer.

"I was installing an interference grid on the surface," he said, "to try to discover the sending station of the messages we've been getting. It will also act, as you know, as an inductor up to a certain range, and in its range is a good deal more accurate than the main inductors of the ship."

"Then get to your damned work," said Alstair harshly, "and pay full attention to it and less to romance!"

Jack plugged in the lead wire from his new grid to the pan-wave receptor. For an hour he worked more and more grimly. There was something very wrong. The inductors showed blank for all about the *Adastra*. The interference grid showed an object of considerable size not more than two million miles distant and to one side of the *Adastra's* course. Suddenly, all indication of that object's existence blanked out. Every dial on the pan-wave receptor went back to zero.

"Damnation!" said Jack under his breath.

He set up a new pattern on the controls, calculated a moment and deliberately changed the pattern on the spare bank of the main inductors, and then simultaneously switched both instruments to their new frequencies. He waited, almost holding his breath, for nearly half a minute. It would take so long for the inductor waves of the new frequency to reach out the two million miles and then collapse into the analyzers and give their report of any object in space which had tended to deform them.

Twenty-six, twenty-seven, twenty-eight seconds. Every alarm bell on the monstrous ship clanged furiously! Emergency doors hissed into place all over the vessel, converting every doorway into an air lock. Seconds later, the vialplates in the main control room began to flash alight.

"Reporting, Rocket Control!" "Reporting, Air Service!" "Reporting, Power Supply."

Jack said crisply: "The main inductors report an object two million miles distant with velocity in our direction. The commander is ill. Please find Vice Commander Alstair."

Then the door of the control room burst open and Alstair himself, raged into the room.

"What the devil!" he rasped. "Ring-



ing a general alarm? Have you gone mad? The inductors—"

Jack pointed to the main inductor bank. Every dial bore out the message of the still-clanging alarms. Alstair stared blankly at them. As he looked, every dial went back to zero.

And Alstair's face went as blank as the dials.

"They felt out our inductor screens," said Jack grimly, "and put out some sort of radiation which neutralized them. So I set up two frequencies, changed both, and they couldn't adjust their neutralizers in time to stop our alarms."

Alstair stood still, struggling with the rage which still possessed him. Then he nodded curtly.

"Quite right. You did good work. Stand by."

And, quite cool and composed, he took command of the mighty space ship, even if there was not much for him to do. In five minutes, in fact, every possible preparation for emergency had been made and he turned again to Jack.

"I don't like you," he said coldly. "As one man to another, I dislike you intensely. But as vice commander and acting commander at the moment, I have to admit that you did good work in uncovering this little trick of our friends to get within striking distance without our knowing they were anywhere near."

Jack said nothing. He was frowning, but it was because he was thinking of Helen. The *Ad Astra* was huge and powerful, but she was not readily maneuverable. She was enormously massive, but she could not be used for ramming. And she possessed within herself almost infinite destructiveness, in the means of producing Caldwell fields for the disintegration of matter, but she contained no weapon more dangerous than a two-thousand-kilowatt vortex gun for the destruction of dangerous animals or vegetation where she might possibly land.

"What's your comment?" demanded Alstair shortly. "How do you size up the situation?"

"They act as if they're planning hostilities," replied Jack briefly, "and they've got four times our maximum acceleration so we can't get away. With that acceleration they ought to be more maneuverable, so we can't dodge them. We're no faintest idea of what weapons they carry, but we know that we can't fight them unless their weapons are very puny indeed. There's just one chance that I can see."

"What's that?"

"They tried to slip up on us. That looks as if they intended to open fire without warning. But maybe they are frightened and only expected to examine us without our getting a chance to attack them. In that case, our only bet is to swing over our signaling beam to the space ship. When they realize we know they're there and still aren't getting hostile, they may not guess we can't fight. They may think we want to be friendly and they'd better not start anything with a ship our size that's on guard."

"Very well. You're detailed to communication duty," said Alstair. "Go ahead and carry out that program. I'll consult the rocket engineers and see what they can improvise in the way of fighting equipment. Dismiss!"

HIS TONE was harsh. It was arrogant. It rasped Jack's nerves and made him bristle all over. But he had to recognize that Alstair wasn't letting his frank dislike work to the disadvantage of the ship. Alstair was, in fact, one of those ambitious officers who are always cordially disliked by everybody, at all times, until an emergency arises. Then their competence shows up.

Jack went to the communications-control room. It did not take long to realign the transmitter beam. Then the

sender began to repeat monotonously the recorded last message from the *Adastra* to the distant and so far unidentified planet of the ringed star. And while the signal went out, over and over again, Jack called on observations control for a sight of the strange ship.

They had a scanner on it now and by stepping up illumination to the utmost, and magnification to the point where the image was as rough as an old-fashioned half-tone cut, they brought the strange ship to the visiplate as a six-inch miniature.

It was egg-shaped and perfectly smooth. There was no sign of external girders, of protruding atmospheric-navigation fins, of escape-boat blisters. It was utterly featureless save for tiny spots which might be portholes, and rocket tubes in which intermittent flames flickered. It was still decelerating to match the speed and course of the *Adastra*.

"Have you got a spectroscopic report on it?" asked Jack.

"Yeh," replied the observations orderly. "An' I don't believe it. They're using fuel rockets—some organic compound. An' the report says the hull of that thing is cellulose, not metal. It's wood, on the outside."

Jack shrugged. No sign of weapons. He went back to his own job. The space ship yonder was being penetrated through and through by the message waves. Its receptors could not fail to be reporting that a tight beam was upon it, following its every movement, and that its presence and probable mission were therefore known to the mighty ship from out of space.

But Jack's own receptors were silent. The tape came out of them utterly blank. No—a queer, scrambled, blurry line, as if the analyzers were unable to handle the frequency which was coming through. Jack read the heat effect. The other space ship was sending with a power which meant five thousand kilo-

watts pouring into the *Adastra*. Not a signal. Grimly, Jack heterodyned the wave on a five-meter circuit and read off its frequency and type. He called the main control.

"They're pouring short stuff into us," he reported stiffly to Alstair. "About five thousand kilowatts of thirty-centimeter waves, the type we use on Earth to kill weevils in wheat. It ought to be deadly to animal life, but of course our hull simply absorbs it."

Helen. Impossible to stop the *Adastra*. They'd started for Proxima Centauri. Decelerating, though they were, they couldn't check much short of the solar system, and they were already attacked by a ship with four times their greatest acceleration. Pouring a deadly frequency into them—a frequency used on Earth to kill noxious insects. Helen was—

"Maybe they think we're dead! They'll know our transmitter's mechanical."

The G. C. phone snapped suddenly, in Alstair's voice.

"Attention, all officers! The enemy space ship has poured what it evidently considers a 'deadly' frequency into us, and is now approaching at full acceleration! Orders are that absolutely no control of any sort is to be varied by a hair's breadth. Absolutely no sign of living intelligence within the *Adastra* is to be shown. You will stand by all operative controls, prepared for maneuver if it should be necessary. But we try to give the impression that the *Adastra* is operating on automatic controls alone! Understood?"

Jack could imagine the reports from the other control rooms. His own receptor sprang suddenly into life. The almost hooped sounds of the call signal, so familiar that they seemed words. Then an extraordinary jumble of noises—words in a human voice! More stridulating sounds. More words in perfectly accurate English. The English words

were in the tones and accents of an officer of the *Adastra*, plainly recorded and retransmitted.

"Communications?" snapped Alstair. "You will not answer this signal! It is an attempt to find out if we survived their ray attack!"

"Check," said Jack.

Alstair was right. Jack watched and listened as the receptor hobbled on. It stopped. Silence for ten minutes. It began again. The *Adastra* hurtled on. The babble from space came to an end. A little later the G. C. phone snapped once more:

"The enemy space ship has increased its acceleration, evidently convinced that we are all dead. It will arrive in approximately four hours. Normal watches may be resumed for three hours unless an alarm is given."

Jack leaned back in his chair, frowning. He began to see the tactics Alstair planned to use. They were bad tactics, but the only ones a defenseless ship like the *Adastra* could even contemplate. It was at least ironic that the greeting the *Adastra* received at the end of a seven-years' voyage through empty space be a dose of a type of radiation used on Earth to exterminate vermin.

But the futility of this attack did not mean that all attacks would be similarly useless. And the *Adastra* simply could not be stopped for many millions of miles, yet. Even if Alstair's desperate plan took care of this particular assailant and this particular weapon, it would not mean—it could not!—that the *Adastra* or the folk within had any faintest chance of defending themselves. And there was Helen—

out any protuberance whatever except the rocket tubes in its rear, it hung motionless with relation to the Earth ship, which meant that its navigators had analyzed her rate of deceleration long since and had matched all the constants of her course with precision.

Helen, her face still tear-streaked, watched as Jack turned up the magnification, and the illumination with it. Her father had collapsed very suddenly and very completely. He was resting quietly now, dozing almost continuously, with his face wearing an expression of utter contentment.

He had piloted the *Adastra* to its first contact with the civilization of another solar system. His lifework was done and he was wholly prepared to rest. He had no idea, of course, that the first actual contact with the strange space ship was a burst of short waves of a frequency deadly to all animal life.

The space ship swelled on the visiplat as Jack turned the knob. He brought it to an apparent distance of a few hundred yards only. With the illumination turned up, even the starlight on the hull would have been sufficient to show any surface detail. But there was literally none. No rivet, no bolt, no line of joining plates. A row of port-holes were dark and dead within.

"And it's wood!" repeated Jack. "Made out of some sort of cellulose which stands the cold of space!"

Helen said queerly: "It looks to me as if it had been grown, rather than built."

Jack blinked. He opened his mouth as if to speak, but the receptor at his elbow suddenly burst into the hootlike stridulations which were the signals from the egglike ship. Then English words, from recordings of previous signals from the *Adastra*. More vowelless, modulated phrases. It sounded exactly as if the beings in the other space ship were trying urgently to open communication and were insisting that they

### III.

THE VISIPLATES showed the strange space ship clearly, now, even without magnification. It was within five miles of the *Adastra* and it had stopped. Perfectly egg-shaped; with-

had the key to the *Adastra's* signals. The temptation to reply was great.

"They've got brains, anyhow," said Jack grimly.

The signals were cut off. Silence. Jack glanced at the wave tape. It showed the same blurring as before.

"More short stuff. At this distance, it ought not only to kill us, but even sterilize the interior of the whole ship. Lucky our hull is heavy alloy with a high hysteresis-rate. Not a particle of that radiation can get through."

Silence for a long, long time. The wave tape showed that a terrific beam of thirty-centimeter waves continued to play upon the *Adastra*. Jack suddenly plugged in observations and asked a question. Yes, the outer hull was heating. It had gone up half a degree in fifteen minutes.

"Nothing to worry about in that," grunted Jack. "Fifteen degrees will be the limit they can put it up, with this power."

The tape came out clear. The supposed death radiation was cut off. The egg-shaped ship darted forward. And then for twenty minutes or more Jack had to switch from one outside vision disk to another to keep it in sight. It hovered about the huge bulk of the *Adastra* with a wary inquisitiveness. Now half a mile away, now no more than two hundred yards, the thing darted here and there with an amazing acceleration and as amazing a braking power. It had only the rocket tubes at the smaller end of its egg-shaped form. It was necessary for it to fling its whole shape about to get a new direction, and the gyroscopes within it must have been tremendously powerful. Even so, the abruptness of its turns were startling.

"I wouldn't like to be inside that thing!" said Jack. "We'd be crushed to a pulp by their normal navigation methods. They aren't men like us. They can stand more than we can."

The thing outside seemed sentient, seemed alive. And by the eagerness of its movements it seemed the more horrible, flitting about the gigantic space ship it now believed was a monstrous coffin.

It suddenly reversed itself and shot back toward the *Adastra*. Two hundred yards, one hundred yards, a hundred feet. It came to a cushioned stop against the surface of the Earth vessel.

"Now we'll see something of them," said Jack crisply. "They landed right at an air lock. They know what that is, evidently. Now we'll see them in their space suits."

But Helen gasped. A part of the side of the strange ship seemed to swell suddenly. It bulged out like a blister. It touched the surface of the *Adastra*. It seemed to adhere. The point of contact grew larger.

"Good Lord!" said Jack blankly. "Is it alive? And is it going to try to eat our ship?"

The general-communication phone rasped sharply:

"Officers with arms to the air lock GH41 immediately! The Centaurians are opening the air lock from the outside. Wait orders there! The viewport in the air lock is working and you will be informed. Go ahead!"

THE PHONE clicked off. Jack seized a heavy gun, one of the force rifles which will stun a man at anything up to eighteen hundred yards and kill at six, when used at full power. His side arm hung in its holster. He swung for the door.

"Jack!" said Helen desperately.

He kissed her. It was the first time their lips had touched, but it seemed the most natural thing in the world, just then. He went racing down the long corridors of the *Adastra* to the rendezvous. And as he raced, his thoughts were not at all those of a scientist and an officer of Earth's first expedition into

interstellar space. Jack was thinking of Helen's lips touching his desperately, of her soft body pressed close to him.

A G. C. speaker whispered overhead as he ran:

"They're inside the air lock. They opened it without trouble. They're testing our air, now. Apparently it suits them all."

The phone fell behind. Jack ran on, panting. Somebody else was running ahead. There were half a dozen, a dozen men grouped at the end of the corridor. A murmur from the side wall.

"... riding at the inner air-lock door. Only four or five of them, apparently, will enter the ship. They are to be allowed to get well away from the air lock. You will keep out of sight. When the emergency locks go on it will be your signal. Use your heavy force guns, increasing power from minimum until they fall paralyzed. It will probably take a good deal of power to subdue them. They are not to be killed if it can be avoided. Ready?"

There were a dozen or more officers on hand. The fat rocket chief. The lean air officer. Subalterns of the other departments. The rocket chief puffed audibly as he wedged himself out of sight. Then the clicking of the inner air-lock door. It opened into the anteroom. Subdued, muffled bootings came from that door. The Things—whatever they were—were inspecting the space suits there. The bootings were distinctly separate and distinctly intoned. But they suddenly came as a babble. More than one Thing was speaking at once. There was excitement, eagerness, an extraordinary triumph in these voices.

Then something stirred in the doorway of the air-lock anteroom. A shadow crossed the threshold. And then the Earthmen saw the creatures who were invading the ship.

For an instant they seemed almost like men. They had two legs, and two dan-

gling things—tentacles—which apparently served as arms and tapered smoothly to ends which split into movable, slender filaments. The tentacles and the legs alike seemed flexible in their entire lengths. There were no "joints" such as men use in walking, and the result was that the Centaureans walked with a curiously rolling gait.

Most startling, though, was the fact that they had no heads. They came wabbling accustomedly out of the air lock, and at the end of one "arm" each carried a curious, semicylindrical black object which they handled as if it might be a weapon. They wore metallic packs fastened to their bodies. The bodies themselves were queerly "grained." There was a tantalizing familiarity about the texture of their skin.

Jack, staring incredulously, looked for eyes, for nostrils, for a mouth. He saw twin slits only. He guessed at them for eyes. He saw no sign of any mouth at all. There was no hair. But he saw a scabrous, brownish substance on the back of one of the Things which turned to boot excitedly at the rest. It looked like bark, like tree bark. And a light burst upon Jack. He almost cried out, but instead reached down and quietly put the lever of his force gun at full power at once.

The Things moved on. They reached a branching corridor and after much arm waving and production of their apparently articulated sounds they separated into two parties. They vanished. Their voices dwindled. The signal for an attack upon them had not yet been given. The officers, left behind, stirred uneasily. But a G. C. phone whispered.

"Steady! They think we're all dead. They're separating again. We may be able to close emergency doors and have each one sealed off from all the rest and then handle them in detail. You men watch the air lock!"

Silence. The humming of a ventilator somewhere near by. Then, sud-



denly, a man screamed shrilly a long distance off, and on the heels of his outcry there came a new noise from one of the Things. It was a high-pitched squealing noise, triumphant and joyous and unspeakably horrible.

Other squealings answered it. There were rushing sounds, as if the other Things were running to join the first. And then came a hissing of compressed air and a hum of motors. Doors snapped shut everywhere, sealing off every part of the ship from every other part. And in the dead silence of their own sealed compartment, the officers on guard suddenly heard inquiring boots.

Two more of the Things came out of the air lock. One of the men moved. The Thing saw him and turned its half-cylindrical object upon him. The man—it was the communications officer—shrieked suddenly and leaped convulsively. He was stone dead even as his muscles tensed for that incredible leap.

And the Thing emitted a high-pitched, triumphant note which was exactly like the other horrible sound they had heard, and sped eagerly toward his body. One of the long, tapering arms lashed out and touched the dead man's hand.

Then Jack's force gun began to hum. He heard another and another open up. In seconds the air was filled with a sound like that of a hive of angry bees. Three more of the Things came out of the air lock, but they dropped in the barrage of force-gun beams. It was only when there was a sudden rush of air toward the lock, showing that the enemy ship had taken alarm and was darting away, that the men dared cease to fill that doorway with their barrage. Then it was necessary to seal the air lock in a hurry. Only then could they secure the Things that had invaded the *Adastra*.

TWO HOURS later, Jack went into the main control room and saluted with an exact precision. His face was rather

white and his expression entirely dogged and resolved. Alstair turned to him, scowling.

"I sent for you," he said harshly, "because you're likely to be a source of trouble. The commander is dead. You heard it?"

"Yes, sir," said Jack grimly. "I heard it."

"In consequence, I am commander of the *Adastra*," said Alstair provocatively. "I have, you will recall, the power of life and death in cases of mutinous conduct, and it is also true that marriage on the *Adastra* is made legal only by executive order bearing my signature."

"I am aware of the fact, sir," said Jack more grimly still.

"Very well," said Alstair deliberately. "For the sake of discipline, I order you to refrain from all association with Miss Bradley. I shall take disobedience of the order as mutiny. I intend to marry her myself. What have you to say to that?"

Jack said as deliberately: "I shall pay no attention to the order, sir, because you aren't fool enough to carry out such a threat! Are you such a fool that you don't see we've less than one chance in five hundred of coming out of this? If you want to marry Helen, you'd better put all your mind on giving her a chance to live!"

A savage silence held for a moment. The two men glared furiously at each other, the one near middle age, the other still a young man, indeed. Then Alstair showed his teeth in a smile that had no mirth whatever in it.

"As man to man I dislike you extremely," he said harshly. "But as commander of the *Adastra* I wish I had a few more like you. We've had seven years of routine on this damned ship, and every officer in quarters is rattled past all usefulness because an emergency has come at last. They'll obey orders, but there's not one fit to give them. The communications officer was killed

by one of those devils, wasn't he?"

"Yes, sir."

"Very well. You're brevet communications officer. I hate your guts; Gary, and I do not doubt that you hate mine, but you have brains. Use them now. What have you been doing?"

"Adjusting a dictawriter, sir, to get a vocabulary of one of these Centaurian's speech, and hooking it up as a two-way translator, sir."

Alstair stared in momentary surprise, and then nodded. A dictawriter, of course, simply analyzes a word into its phonetic parts, sets up the analysis and picks out a card to match its formula. Normally, the card then actuates a printer. However, instead of a typechoosing record, the card can contain a record of an equivalent word in another language, and then operates a speaker.

Such machines have been of only limited use on Earth because of the need for so large a stock of vocabulary words, but have been used to some extent for literal translations both of print and speech. Jack proposed to record a Centaurian's vocabulary with English equivalents, and the dictawriter, hearing the queer hoots the strange creature uttered, would pick out a card which would then cause a speaker to enunciate its English synonym.

The reverse, of course, would also occur. A conversation could be carried on with such a prepared vocabulary without awaiting practice in understanding or imitating the sounds of another language.

"Excellent!" said Alstair curtly. "But put some one else on the job if you can. It should be reasonably simple, once it's started. But I need you for other work. You know what's been found out about these Centaurians, don't you?"

"Yes, sir. Their hand weapon is not unlike our force guns, but it seems to be considerably more effective. I saw it kill the communications officer."

"But the creatures themselves!"

"I helped tie one of them up."

"What do you make of it? I've a physician's report, but he doesn't believe it himself!"

"I don't blame him, sir," said Jack grimly. "They're not our idea of intelligent beings at all. We haven't any word for what they are. In one sense they're plants, apparently. That is, their bodies seem to be composed of cellulose fibers where ours are made of muscle fibers. But they are intelligent, fiendishly intelligent."

"The nearest we have to them on Earth are certain carnivorous plants, like pitcher plants and the like. But they're as far above a pitcher plant as a man is above a sea anemone, which is just as much an animal as a man is. My guess, sir, would be that they're neither plant nor animal. Their bodies are built up of the same materials as earthly plants, but they move about like animals do on Earth. They surprise us, but we may surprise them, too. It's quite possible that the typical animal form on their planet is sessile like the typical plant form on ours."

Alstair said bitterly: "And they look on us, animals, as we look on plants!"

Jack said without expression: "Yes, sir. They eat through holes in their arms. The one who killed the communications officer seized his arm. It seemed to exude some fluid that liquefied his flesh instantly. It sucked the liquid back in at once. If I may make a guess, sir——"

"Go ahead," snapped Alstair. "Everybody else is running around in circles, either marveling or sick with terror."

"The leader of the party, sir, had on what looked like an ornament. It was a band of leather around one of its arms."

"Now, what the devil——"

"We had two men killed. One was the communications officer and the other was an orderly. When we finally sub-

doed the Centaurian who'd killed that orderly, it had eaten a small bit of him, but the rest of the orderly's body had undergone some queer sort of drying process, from chemicals the Thing seemed to carry with it."

Alstair's throat worked as if in nausea. "I saw it."

"It's a fanciful idea," said Jack grimly, "but if a man was in the position of that Centaurian, trapped in a space ship belonging to an alien race, with death very probably before him, well, about the only thing a man would strap to his body, as the Centaurian did the dried, preserved body of that orderly——"

"Would be gold," snapped Alstair. "Or platinum, or jewels which he would hope to fight clear with!"

"Just so," said Jack. "Now, I'm only guessing, but those creatures are not human, nor even animals. Yet they eat animal food. They treasure animal food as a human being would treasure diamonds. An animal's remains—leather—they wear as an ornament. It looks to me as if animal tissue was rather rare on their planet, to be valued so highly. In consequence——"

Alstair stood up, his features working. "Then our bodies would be the same as gold to them! As diamonds! Gary, we haven't the ghost of a chance to make friends with these fiends!"

Jack said dispassionately: "No; I don't think we have. If a race of beings with tissues of metallic gold landed on Earth, I rather think they'd be murdered. But there's another point, too. There's Earth. From our course, these creatures can tell where we came from, and their space ships are rather good. I think I'll put somebody else on the dictawriter job and see if I can flash a message back home. No way to know whether they get it, but they ought to be watching for one by the time it's there. Maybe they've improved their

receptors. They intended to try, anyhow."

"Men could meet these creatures' ships in space," said Alstair harshly, "if they were warned. And guns might answer, but if they didn't handle these devils Caldwell torpedoes would. Or a suicide squad, using their bodies for bait. We're talking like dead men, Gary."

"I think, sir," said Jack, "we are dead men." Then he added: "I shall put Helen Bradley on the dictawriter, with a guard to handle the Centaurian. He'll be bound tightly."

The statement tacitly assumed that Alstair's order to avoid her was withdrawn. It was even a challenge to him to repeat it. And Alstair's eyes glowed and he controlled himself with difficulty.

"Damn you, Gary," he said savagely, "get out!"

He turned to the visiplat which showed the enemy ship as Jack left the control room.

THE EGG-SHAPED ship was two thousand miles away now, and just decelerating to a stop. In its first flight it had rocketed here and there like a mad thing. It would have been impossible to hit it with any projectile, and difficult in the extreme even to keep radiation on it in anything like a tight beam. Now, stopped stock-still with regard to the *Adastra*, it hung on, observing, very probably devising some new form of devilment. So Alstair considered, anyhow. He watched it somberly.

The resources of the *Adastra*, which had seemed so vast when she took off from Earth, were pitifully inadequate to handle the one situation which had greeted her, hostility. She could have poured out the treasures of man's civilization to the race which ruled this solar system. Savages, she could have uplifted. Even to a race superior to men

she could have offered man's friendship and eager pupilage. But these creatures that—

The space ship stayed motionless. Probably signaling back to its home planet, demanding orders. Reports came in to the *Adastra's* main control room and Alstair read them. The Centaureans were unquestionably extracting carbon dioxide from the air. That compound was to their metabolism what oxygen is to men, and in pure air they could not live.

But their metabolic rate was vastly greater than that of any plant on Earth. It compared with the rate of earthly animals. They were not plants by any definition save that of constitution, as a sea anemone is not an animal except by the test of chemical analysis.

The Centaureans had a highly organized nervous system, the equivalent of brains, and both great intelligence and a language. They produced sounds by a stridulating organ in a special body cavity. And they felt emotion.

A captive creature when presented with various objects showed special interest in machinery, showing an acute realization of the purpose of a small sound recorder and uttering into it an entire and deliberate series of sounds. Human clothing it fingered eagerly. Cloth it discarded, when of cotton or rayon, but it displayed great excitement at the feel of a woolen shirt and even more when a leather belt was given to it. It placed the belt about its middle, fastening the buckle without a fumble after a single glance at its working.

It unraveled a thread from the shirt and consumed it, rocking to and fro as if in ecstasy. When meat was placed before it, it seemed to become almost delirious with excitement. A part of the meat it consumed instantly, to ecstatic swayings. The rest it preserved by a curious chemical process, using substances from a small metal pack it had worn and for which it made gestures.

Its organs of vision were behind two slits in the upper part of its body, and no precise examination of the eyes themselves had been made. But the report before Alstair said specifically that the Centaurian displayed an avid eagerness whenever it caught sight of a human being. And that the eagerness was not of a sort to be reassuring.

It was the sort of excitement—only much greater—which it had displayed at the sight of wool and leather. As if by instinct, said the report, the captive Centaurian had several times made a gesture as if turning some weapon upon a human when first it sighted him.

Alstair read this report and others. Helen Bradley reported barely two hours after Jack had assigned her to the work.

"I'm sorry, Helen," said Alstair ungraciously. "You shouldn't have been called on for duty. Gary insisted on it. I'd have left you alone."

"I'm glad he did," said Helen steadily. "Father is dead, to be sure, but he was quite content. And he died before he found out what these Centaureans are like. Working was good for me. I've succeeded much better than I even hoped. The Centaurian I worked with was the leader of the party which invaded this ship. He understood almost at once what the dictewriter was doing, and we've a good vocabulary recorded already. If you want to talk to him, you can."

Alstair glanced at the visiplate. The enemy ship was still motionless. Easily understandable, of course. The *Adastra's* distance from Proxima Centauri could be measured in hundreds of millions of miles, now, instead of millions of billions, but in another terminology it was light-hours away still. If the space ship had signaled its home planet for orders, it would still be waiting for a reply.

Alstair went heavily to the biology laboratory, of which Helen was in

charge, just as she was in charge of the biological specimens—rabbits, sheep, and a seemingly endless array of small animals—which on the voyage had been bred for a food supply and which it had been planned to release should a planet suitable for colonizing revolve about the ringed star.

THE CENTAURIAN was bound firmly to a chair with a myriad of cords. He—she—it, was utterly helpless. Beside the chair the dictewriter and its speaker were coupled together. From the Centaurian came booted notes which the machine translated with a rustling sound between words.

"You — are — commander — this — ship?" the machine translated without intonation.

"I am," said Alstair, and the machine booted musically.

"This—woman—man—dead," said the machine tonelessly again, after more sounds from the extraordinary living thing which was not an animal.

Helen interjected swiftly: "I told him my father was dead."

The machine went on: "I—buy—all—dead — man—on—ship—give—metal—gold—you—like—"

Alstair's teeth clicked together. Helen went white. She tried to speak, and choked upon the words.

"This," said Alstair in mirthless bitterness, "is the beginning of the interstellar friendship we hoped to institute!"

Then the G. C. phone said abruptly:

"Calling Commander Alstair! Radiation from ahead! Several wave lengths, high intensity! Apparently several space ships are sending, though we can make out no signals!"

And then Jack Gary came into the biology laboratory. His face was set in grim lines. It was very white. He saluted with great precision.

"I didn't have to work hard, sir," he said sardonically. "The last communications officer had been taking his

office more or less as a sinecure. We'd had no signals for seven years, and he didn't expect any. But they're coming through and have been for months.

"They left Earth three years after we did. A chap named Callaway, it seems, found that a circularly polarized wave makes a tight beam that will hold together forever. They've been sending to us for years past, no doubt, and we're getting some of the first messages now.

"They've built a second *Adastra*, sir, and it's being manned—heil, no! It was manned four years ago! It's on the way out here now! It must be at least three years on the way, and it has no idea of these devils waiting for it. Even if we blow ourselves to bits, sir, there'll be another ship from Earth coming, unarmed as we are, to run into these devils when it's too late to stop—"

The G. C. phone snapped again:

"Commander Alstair! Observations reporting! The external hull temperature has gone up five degrees in the past three minutes and is still climbing. Something's pouring heat into us at a terrific rate!"

Alstair turned to Jack. He said with icy politeness:

"Gary, after all there's no use in our continuing to hate each other. Here is where we all die together. Why do I still feel inclined to kill you?"

But the question was rhetorical only. The reason was wholly clear. At the triply horrible news, Helen had begun to cry softly. And she had gone blindly into Jack's arms to do it.

#### IV.

THE SITUATION was, as a matter of fact, rather worse than the first indications showed. The external hull temperature, for instance, was that of the generalizing thermometer, which averaged for all the external thermometers. A glance at the thermometer bank, through a visiphone connection,

showed the rearmost side of the *Adastu* at practically normal. It was the forward hemisphere, the side nearest Proxima Centauri, which was heating. And that hemisphere was not heating equally. The indicators which flashed red lights were closely grouped.

Alstair regarded them with a stony calm in the visiplane.

"Squarely in the center of our disk, as they see it," he said icily. "It will be that fleet of space ships, of course."

Jack Gary said crisply: "Sir, the ship from which we took prisoners made contact several hours earlier than we expected. It must be that, instead of sending one vessel with a transmitter on board, they sent a fleet, and a scout ship on ahead! That scout ship has reported that we laid a trap for some of her crew, and consequently they've opened fire!"

Alstair said sharply into a G. C. transmitter:

"Sector G90 is to be evacuated at once. It is to be sealed off immediately and all occupants will emerge from air locks. Adjoining sectors are to be evacuated except by men on duty, and they will don space suits immediately."

He clicked off the phone and added calmly: "The external temperature over part of G90 is four hundred degrees now. Dull-red heat. In five minutes it should melt. They'll have a hole bored right through us in half an hour."

Jack said urgently: "Sir! I'm pointing out that they've attacked because the scout ship reported we laid a trap for some of its crew! We have just the ghost of a chance——"

"What?" demanded Alstair bitterly. "We've no weapons!"

"The dictawriter, sir!" snapped Jack. "We can talk to them now!"

Alstair said harshly: "Very well, Gary. I appoint you ambassador. Go ahead!"

He swung on his heel and went swiftly from the control room. A mo-

ment later his voice came out of the G. C. phone: "Calling the Rocket Chief! Report immediately on personal visiphone. Emergency!"

His voice cut off, but Jack was not aware of it. He was plugging in to communications and demanding full power on the transmission beam and a widening of its arc. He snapped one order after another and explained to Helen in swift asides.

She grasped the idea at once. The Centaurian in the biology laboratory was bound, of course. No flicker of expression could be discovered about the narrow slits which were his vision organs. But Helen—knowing the words of the vocabulary cards—spoke quietly and urgently into the dictawriter microphone. Hoodlike noises came out of the speaker in their place, and the Centaurian stirred. Sounds came from him in turn, and the speaker said woodenly:

"I—speak—ship—planet. Yes."

And as the check-up came through from communications control, the eerie, stridulated, unconsonanted noises of his language filled the biology laboratory and went out on the widened beam of the main transmitter.

Ten thousand miles away the Centaurian scout ship hovered. The *Adastu* bored on toward the ringed sun which had been the goal of mankind's most daring expedition. From ten thousand miles she would have seemed a mere dot, but the telescopes of the Centaurians would show her every detail. From a thousand miles she would seem a toy, perhaps, intricately crosscrossed with strengthening members.

From a distance of a few miles only, though, her gigantic size could be realized fully. Five thousand feet in diameter, she dwarfed the hugest of those distant, unseen shapes in emptiness which made up a hostile fleet now pouring deadly beams upon her.

From a distance of a few miles, too, the effect of that radiation could be



seen. The *Adastra's* hull was alloy steel; tough and necessarily with a high hysteresis rate. The alternating currents of electricity induced in that steel by the Centaurian radiation would have warmed even a copper hull. But the alloy steel grew hot. It changed color. It glowed faintly red over an area a hundred feet across.

A rocket tube in that area abruptly ceased to emit its purple, lambent flame. It had been cut off. Other rockets increased their power a trifle to make up for it. The dull red glow of the steel increased. It became carmine. Slowly, inexorably, it heated to a yellowish tinge. It became canary in color. It tended toward blue.

Vapor curled upward from its surface, streaming away from the tortured, melting surface as if drawn by the distant sun. That vapor grew thick; dazzlingly bright; a veritable cloud of metallic steam. And suddenly there was a violent eruption from the center of the *Adastra's* lighted hemisphere. The outer hull was melted through. Air from the interior burst out into the void, flinging masses of molten, vaporizing metal before it. It spread with an incredible rapidity, flaring instantly into the attenuated, faintly glowing mist of a comet's tail.

The visiplate images inside the *Adastra* grew dim. Stars paled ahead. The Earth ship had lost a part of her atmosphere and it fled on before her, writhing. Already it had spread into so vast a space that its density was immeasurable, but it was still so much more dense than the infinite emptiness of space that it filled all the cosmos before the *Adastra* with a thinning nebulousity.

And at the edges of the huge gap in the big ship's hull, the thick metal bubbled and steamed, and the interior partitions began to glow with an unholy light of dull-red heat, which swiftly went up

to carmine and began to turn faintly yellow.

IN THE MAIN control room, Alstair watched bitterly until the visiplates showing the interior of section G90 fused. He spoke very calmly into the microphone before him.

"We've got less time than I thought," he said deliberately. "You'll have to hurry. It won't be sure at best, and you've got to remember that these devils will undoubtedly puncture us from every direction and make sure there's absolutely nothing living on board. You've got to work something out, and in a hurry, to do what I've outlined!"

A half-hysterical voice came back to him.

"But sir, if I cut the sonic vibrations in the rockets we'll go up in a flare! A single instant! The disintegration of our fuel will spread to the tubes and the whole ship will simply explode! It will be quick!"

"You fool!" snarled Alstair. "There's another ship from Earth on the way! Unwarned! And unarmed like we are! And from our course these devils can tell where we came from! We're going to die, yes! We won't die pleasantly! But we're going to make sure these fiends don't start out a space fleet for Earth! There's to be no euthanasia for us! We've got to make our dying do some good! We've got to protect humanity!"

Alstair's face, as he snarled into the visiplate, was not that of a martyr or a person making a noble self-sacrifice. It was the face of a man overawing and bullying a subordinate into obedience.

With a beam of radiation playing on his ship which the metal hull absorbed and transformed into heat, Alstair raged at this department and that. A second bulkhead went, and there was a second eruption of vaporized metal and incandescent gas from the monster vessel. Millions of miles away, a wide-flung



*It was an awesome sight. Fibrous tentacles bound, helpless, in the chair before vast intricate apparatus—waiting—*

ring of egg-shaped space ships lay utterly motionless, giving no sign of life and looking like monsters asleep. But from them the merciless beams of radiation sped out and focused upon one spot upon the *Adaura's* hull, and it spewed forth frothing metal and writhing gases and now and again some still recognizable object which flared and exploded as it emerged.

And within the innumerable compartments of the mighty ship, human beings reacted to their coming doom in manners as various as the persons themselves. Some screamed. A few of the more sullen members of the crew seemed to go mad, to become homicidal maniacs. Still others broke into the stores and proceeded systematically but in some haste to drink themselves coma-

tose. Some women clutched their children and wept over them. And some of them went mad.

But Alistair's snarling, raging voice maintained a semblance of discipline in a few of the compartments. In a machine shop men worked savagely, cursing, and making mistakes as they worked which made their work useless. The lean air officer strode about his domain, a huge spanner in his hand, and smote with a righteous anger at any sign of panic. The rocket chief, puffing, manifested an unexpected genius for sustained profanity, and the rockets kept their pale purple flames out in space without a sign of flickering.

But in the biology laboratory the scene was one of quiet, intense concentration. Bound to helplessness, the Centaurian, featureless and inscrutable, filled the room with its peculiar form of speech. The dictewriter rustled softly, senselessly analyzing each of the sounds and senselessly questing for vocabulary cards which would translate them into English wordings. Now and again a single card did match up. Then the machine translated a single word of the Centaurian's speech.

"—ship—" A long series of sounds, varying rapidly in pitch, in intensity, and in emphasis. "—men—" Another long series. "—talk men—"

The Centaurian ceased to make its hootlike noises. Then, very carefully, it emitted new ones. The speaker translated them all. The Centaurian had carefully selected words recorded with Helen.

"He understands what we're trying to do," said Helen, very pale.

The machine said: "You—talk—machine—talk—ship."

Jack said quietly into the transmitter: "We are friends. We have much you want. We want only friendship. We have killed none of your men except in self-defense. We ask peace. If we do

not have peace, we will fight. But we wish peace."

He said under his breath to Helen, as the machine rustled and the speaker hooted: "Bluff, that war talk. I hope it works!"

**SILENCE.** Millions of miles away, unseen space ships aimed a deadly radiation in close, tight beams at the middle of the *Adastra's* disk. Quietly enough, that radiation would have been utterly harmless to a man's body. It would have passed through, undetected.

But the steel of the Earth ship's hull stopped and absorbed it as eddy currents. The eddy currents became heat. And a small volcano vomited out into space the walls, the furnishing, the very atmosphere of the *Adastra* through the hole that the heat had made.

It was very quiet indeed in the biology laboratory. The receptor was silent. One minute. Two minutes. Three. The radio waves carrying Jack's voice traveled at the speed of light, but it took no less than ninety seconds for them to reach the source of the beams which were tearing the *Adastra* to pieces. And there was a time loss there, and ninety seconds more for other waves to hurtle through space at one hundred and eighty-six thousand miles each second with the reply.

The receptor hooted unimpassionately. The dictewriter rustled softly. Then the speaker said without expression:

"We — friends — now — no — fight — ships — come — to — take — you — planet."

And simultaneously the miniature volcano on the *Adastra's* hull lessened the violence of its eruption, and slowly its molten, bubbling edges ceased first to stream, and then to bubble, and from the blue-white of vaporizing steel they cooled to yellow, and then to carmine, and more slowly to a dull red, and more slowly still to the glistening, infinitely white metallic surface of steel which cools where there is no oxygen.

Jack said crisply into the control-room microphone: "Sir, I have communicated with the Centaurians and they have ceased fire. They say they are sending a fleet to take us to their planet."

"Very good," said Alstair's voice bitterly, "especially since nobody seems able to make the one contrivance that would do some good after our death. What next?"

"I think it would be a good idea to release the Centaurian here," said Jack. "We can watch him, of course, and paralyze him if he acts up. It would be a diplomatic thing to do, I believe."

"You're ambassador," said Alstair sardonically. "We've got time to work, now. But you'd better put somebody else on the ambassadorial work and get busy again on the job of sending a message back to Earth, if you think you can adapt a transmitter to the type of wave they'll expect."

His image faded. And Jack turned to Helen. He felt suddenly very tired.

"That is the devil of it," he said drearily. "They'll expect a wave like they sent us, and with no more power than we have, they'll hardly pick up anything else! But we picked up in the middle of a message and just at the end of their description of the sending outfit they're using on Earth. Undoubtedly they'll describe it again, or rather they did describe it again, four years back, and we'll pick it up if we live long enough. But we can't even guess when that will be. You're going to keep on working with this—creature, building up a vocabulary?"

Helen regarded him anxiously. She put her hand upon his arm.

"He's intelligent enough," she said urgently. "I'll explain to him and let somebody else work with him. I'll come with you. After all, we—we may not have long to be together."

"Perhaps ten hours," said Jack tiredly.

He waited, somberly, while she explained in carefully chosen words—which the dictewriter translated—to the Centaurian. She got an assistant and two guards. They released the headless Thing. It offered no violence. Instead, it manifested impatience to continue the work of building up in the translator files a vocabulary through which a complete exchange of ideas could take place.

JACK and Helen went together to the communications room. They ran the Earth message, as received so far. It was an extraordinary hodgepodge. Four years back, Earth had been enthusiastic over the thought of sending word to its most daring adventurers. A flash of immaterial energy could travel tirelessly through uncountable millions of billions of miles of space and overtake the explorers who had started three years before. By its text, this message had been sent some time after the first message of all. In the sending, it had been broadcast all over the Earth, and many millions of people undoubtedly had thrilled to the thought that they heard words which would span the space between two suns.

But the words were not helpful to those on the *Adastra*. The message was a "cheer-up" program, which began with lusty singing by a popular quartet, continued with wisecracks by Earth's most highly paid comedian—and his jokes were all very familiar to those on the *Adastra*—and then a congratulatory address by an eminent politician, and other drivel. In short, it was a hodgepodge of trash designed to gain publicity by means of the Earth broadcast for those who took part in it.

It was not helpful to those on the *Adastra*, with the hull of the ship punctured, death before them, and probably destruction for the whole human race to follow as a consequence of their voyage.

Jack and Helen sat quietly and

listened. Their hands clasped unconsciously. Rather queerly, the extreme brevity of the time before them made extravagant expressions of affection seem absurd. They listened to the unspeakably vulgar message from Earth without really hearing it. Now and again they looked at each other.

In the biology laboratory the building-up of a vocabulary went on swiftly. Pictures came into play. A second Centaurian was released, and by his skill in delineation—which proved that the eyes of the plant men functioned almost identically with those of Earth men—added both to the store of definitions and equivalents and to knowledge of the Centaurian civilization.

Piecing the information together, the civilization began to take on a strange resemblance to that of humanity. The Centaurians possessed artificial structures which were undoubtedly dwelling houses. They had cities, laws, arts—the drawing of the second Centaurian was proof of that—and sciences. The science of biology in particular was far advanced, taking to some extent the place of metallurgy in the civilization of men. Their structures were grown, not built. Instead of metals to shape to their own ends, they had forms of protoplasm whose rate and manner of growth they could control.

Houses, bridges, vehicles—even space ships were formed of living matter which was thrown into a quiescent non-living state when it had attained the form and size desired. And it could be caused to become active again at will, permitting such extraordinary features as the blisterlike connection that had been made by the space ship with the hull of the *Adastra*.

So far, the Centaurian civilization was strange enough, but still comprehensible. Even men might have progressed in some such fashion had civilization developed on Earth from a different point of departure. It was the

economics of the Centaurians which was at once understandable and horrifying to the men who learned of it.

The Centaurian race had developed from carnivorous plants, as men from carnivorous forebears. But at some early date in man's progression, the worship of gold began. No such diversion of interest occurred upon the planets of Proxima Centauri. As men have devastated cities for gold, and have cut down forests and gutted mines and ruthlessly destroyed all things for gold or for other things which could be exchanged for gold, so the Centaurians had quested animals.

As men exterminated the buffalo in America, to trade his hide for gold, so the Centaurians had ruthlessly exterminated the animal life of their planet. But to Centaurians, animal tissue itself was the equivalent of gold. From sheer necessity, ages since, they had learned to tolerate vegetable foodstuffs. But the insensate lust for flesh remained. They had developed methods for preserving animal food for indefinite periods. They had dredged their seas for the last and smallest crustacean. And even space travel became a desirable thing in their eyes, and then a fact, because telescopes showed them vegetation on other planets of their sun, and animal life as a probability.

Three planets of Proxima Centauri were endowed with climates and atmospheres favorable to vegetation and animal life, but only on one planet now, and that the smallest and most distant, did any trace of animal life survive. And even there the Centaurians hunted feverishly for the last and dwindling colonies of tiny quadrupeds which burrowed hundreds of feet below a frozen continent.

It became clear that the *Adastra* was an argosy of such treasure—in the form of human beings—as no Centaurian could ever have imagined to exist. And it became more than ever clear that a

voyage to Earth would command all the resources of the race. Billions of human beings! Trillions of lesser animals! Uncountable creatures in the seas! All the Centaurian race would go mad with eagerness to invade this kingdom of riches and ecstasy, the ecstasy felt by any Centaurian when consuming the prehistoric foodstuff of his race.

### V.

EGG-SHAPED, featureless ships of space closed in from every side at once. The thermometer banks showed a deliberate, painstaking progression of alarm signals. One dial glowed madly red and faded, and then another, and yet another, as the Centaurian ships took up their positions. Each such alarm, of course, was from the momentary impact of a radiation beam on the *Adastra's* hull.

Twenty minutes after the last of the beams had proved the *Adastra's* helplessness, an egglike ship approached the Earth vessel and with complete precision made contact with its forward side above an air lock. Its hull bellied out in a great blister which adhered to the steel.

Alstair watched the visiplate which showed it, his face very white and his hands clenched tightly. Jack Gary's voice, strained and hoarse, came from the biology-laboratory communicator.

"Sir, a message from the Centaurians. A ship has landed on our hull and its crew will enter through the air lock. A hostile move on our part, of course, will mean instant destruction."

"There will be no resistance to the Centaurians," said Alstair harshly. "It is my order! It would be suicide!"

"Even so, sir," said Jack's voice savagely, "I still think it would be a good idea!"

"Stick to your duty!" rasped Alstair. "What progress has been made in communication?"

"We have vocabulary cards for nearly five thousand words. We can converse on nearly any subject, and all of them are unpleasant. The cards are going through a duplicator now and will be finished in a few minutes. A second dictawriter with the second file will be sent you as soon as the cards are complete."

In a visiplate, Alstair saw the headless figures of Centaurians emerging from the entrance to an air lock in the *Adastra's* hull.

"Those Centaurians have entered the ship," he snapped as an order to Jack. "You're communications officer! Go meet them and lead their commanding officer here!"

"Check!" said Jack grimly.

It sounded like a sentence of death, that order. In the laboratory he was very pale indeed. Helen pressed close to him.

The formerly captive Centaurian hooted into the dictawriter, inquiringly. The speaker translated.

"What—command?"

Helen explained. So swiftly does humanity accustom itself to the incredible that it seemed almost natural to address a microphone and hear the hoots and stridulations of a nonhuman voice fill the room with her meaning.

"I—go—also—they—no—kill—yet."

The Centaurian rolled on before. With an extraordinary dexterity, he opened the door. He had merely seen it opened. Jack took the lead. His side-arm force gun remained in its holster beside him, but it was useless. He could probably kill the plant man behind him, but that would do no good.

Dim hootings ahead. The plant man made sounds—loud and piercing sounds. Answers came to him. Jack came in view of the new group of invaders. There were twenty or thirty of them, every one armed with half-cylindrical objects, larger than the first creatures had carried.



At sight of Jack there was excitement. Eager trembling of the armlike tentacles at either side of the headless trunks. There were instinctive, furtive movements of the weapons. A loud hooting as of command. The Things were still. But Jack's flesh crawled from the feeling of sheer, carnivorous lust that seemed to emanate from them.

His guide, the former captive, exchanged incomprehensible noises with the newcomers. Again a ripple of excitement in the ranks of the plant men.

"Come," said Jack curtly.

HE LED the way to the main control room. Once they heard some one screaming monotonously. A woman cracked under the coming of doom. A hooting babble broke the silence among the ungainly Things which followed Jack. Again an authoritative note silenced it.

The control room. Alstair looked like a man of stone, of marble, save that his eyes burned with a fierce and almost maniacal flame. A visiplate beside him showed a steady stream of Centaurs entering through a second air lock. There were hundreds of them, apparently. The dictawriter came in, under Helen's care. She cried out in instinctive horror at sight of so many of the monstrous creatures at once in the control room.

"Set up the dictawriter," said Alstair in a voice so harsh, so brittle that it seemed pure ice.

Trembling, Helen essayed to obey.

"I am ready to talk," said Alstair harshly into the dictawriter microphone.

The machine, rustling softly, translated. The leader of the new party hooted in reply. An order for all officers to report here at once, after setting all controls for automatic operation of the ship. There was some difficulty with the translation of the Centaurian equivalent of "automatic." It was not in the vocabulary file. It took time.

Alstair gave the order. Cold sweat stood out upon his face, but his self-control was iron.

A second order, also understood with a certain amount of difficulty. Copies of all technical records, and all—again it took time to understand—all books bearing on the construction of this ship were to be taken to the air lock by which these plant men had entered. Samples of machinery, generators, and weapons to the same destination.

Again Alstair gave the order. His voice was brittle, was even thin, but it did not falter or break.

The Centaurian leader hooted an order over which the dictawriter rustled in vain. His followers swept swiftly to the doors of the control room. They passed out, leaving but four of their number behind. And Jack went swiftly to Alstair. His force gun snapped out and pressed deep into the commander's middle. The Centaurs made no movement of protest.

"Damn you!" said Jack, his voice thick with rage. "You've let them take the ship! You plan to bargain for your life! Damn you, I'm going to kill you and fight my way to a rocket tube and send this ship up in a flare of clean flame that'll kill these devils with us!"

But Helen cried swiftly: "Jack! Don't! I know!"

Like an echo her words—because she was near the dictawriter microphone—were repeated in the houting sounds of the Centaurian language. And Alstair, livid and near to madness, nevertheless said harshly in the lowest of tones:

"You fool! These devils can reach Earth, now they know it's worth reaching! So even if they kill every man on the ship but the officers—and they may—we've got to navigate to their planet and land there." His voice dropped to a rasping whisper and he raged almost soundlessly: "And if you think I want to live through what's coming, shoot!"

Jack stood rigid for an instant. Then

he stepped back. He saluted with an elaborate, mechanical precision.

"I beg your pardon, sir," he said unsteadily. "You can count on me hereafter."

One of the officers of the *Adastra* stumbled into the control room. Another. Still another. They trickled in. Six officers out of thirty.

A Centaurian entered with the curious rolling gait of his race. He went impatiently to the dictawriter and made noises.

"These—all—officers?" asked the machine tonelessly.

"The air officer shot his family and himself," gasped a subaltern of the air department. "A bunch of Muts charged a rocket tube and the rocket chief fought them off. Then he bled to death from a knife in his throat. The stores officer was——"

"Stop!" said Alstair in a thin, high voice. He tore at his collar. He went to the microphone and said thinly: "These are all the officers still alive. But we can navigate the ship."

The Centaurian—he wore a wide band of leather about each of his arms and another about his middle—waddled to the G. C. phone. The tendrils at the end of one arm manipulated the switch expertly. He emitted strange, formless sounds—and hell broke loose!

THE VISIPLATES all over the room emitted high-pitched, squealing sounds. They were horrible. They were ghastly. They were more terrible than the sounds of a wolf pack hard on the heels of a fear-mad deer. They were the sounds Jack had heard when one of the first invaders of the *Adastra* saw a human being and killed him instantly. And other sounds came out of the visiplates, too. There were human screams. There were even one or two explosions.

But then there was silence. The five Centaurians in the control room quiv-

ered and trembled. A desperate blood-lust filled them, the unreasoning, blind, instinctive craving which came of evolution from some race of carnivorous plants become capable of movement through the desperate need for food.

The Centaurian with the leather ornaments went to the dictawriter again. He hooted in it:

"Want—two—men—go—from—ship—learn from—them—now."

There was an infinitely tiny sound in the main control room. It was a drop of cold sweat, falling from Alstair's face to the floor. He seemed to have shriveled. His face was an ashy gray. His eyes were closed. But Jack looked steadily from one to the other of the surviving officers.

"That will mean vivisection. I suppose," he said harshly. "It's certain they plan to visit Earth, else—intelligent as they are—they wouldn't have wiped out everybody but us. Even for treasure. They'll want to try out weapons on a human body, and so on. Communications is about the most useless of all the departments now, sir, I volunteer."

Helen gasped: "No, Jack! No!"

Alstair opened his eyes. "Gary has volunteered. One more man to volunteer for vivisection." He said it in the choked voice of one holding to sanity by the most terrible of efforts. "They'll want to find out how to kill men. Their thirty-centimeter waves didn't work. They know the beams that melted our hull wouldn't kill men. I can't volunteer! I've got to stay with the ship." There was despair in his voice. "One more man to volunteer for these devils to kill slowly!"

Silence. The happenings of the past little while, and the knowledge of what still went on within the *Adastra's* innumerable compartments, had literally stunned most of the six. They could not think. They were mentally dazed, emotionally paralyzed by the sheer horrors they had encountered.

Then Helen stumbled into Jack's arms. "I'm—going, too!" she gasped. "We're—all going to die! I'm not needed! And I can—die with Jack."

Alstair groaned. "Please!"

"I'm—going!" she panted. "You can't stop me! With Jack! Whither thou goest—"

Then she choked. She pressed close. The Centaurian of the leather belts hooted impatiently into the dictawriter.

"These—two—come."

Alstair said in a strange voice: "Wait!" Like an automaton, he moved to his desk. He took up an electropen. He wrote, his hands shaking. "I am mad," he said thinly. "We are all mad. I think we are dead and in hell. But take this."

JACK stuffed the official order slip in his pocket. The Centaurian of the leather bands hooted impatiently. He led them, with his queer, rolling gait, toward the air lock by which the plant men had entered. Three times they were seen by roving Things, which emitted that triply horrible shrill squeal. And each time the Centaurian of the leather bands hooted authoritatively and the plant men withdrew.

Once, too, Jack saw four creatures swaying backward and forward about something on the floor. He reached out his hands and covered Helen's eyes until they were past.

They came to the air lock. Their guide pointed through it. The man and the girl obeyed. Long, rubbery tentacles seized them and Helen gasped and was still. Jack fought fiercely, plotting her name. Then something struck him savagely. He collapsed.

He came back to consciousness with a feeling of tremendous weight upon him. He stirred, and with his movement some of the oppression left him. A light burned, not a light such as men know on Earth, but a withering flare which beat restlessly at the

confines of a transparent globe which contained it. There was a queer smell in the air, too, an animal smell. Jack sat up. Helen lay beside him, unconscious and apparently unhurt. None of the Centaurians seemed to be near.

He chafed her wrists helplessly. He heard a stuttering sound and with each of the throbs of noise felt a momentary acceleration. Rockets, fuel rockets.

"We're on one of their damned ships!" said Jack coldly. He felt for his force gun. It was gone.

Helen opened her eyes. She stared vaguely about. Her eyes fell upon Jack. She shuddered suddenly and pressed close to him.

"What—what happened?"

"We'll have to find out," replied Jack grimly.

The floor beneath his feet careened suddenly. Instinctively, he glanced at a porthole which until then he had only unconsciously noted. He gazed out into the utterly familiar blackness of space, illuminated by very many tiny points of light which were stars. He saw a ringed sun and points of light which were planets.

One of those points of light was very near. Its disk was perceptible, and polar snow caps, and the misty alternation of greenish areas which would be continents with the indescribable tint which is ocean bottom when viewed from beyond a planet's atmosphere.

Silence. No hootings of that strange language without vowels or consonants which the Centaurians used. No sound of any kind for a moment.

"We're heading for that planet, I suppose," said Jack quietly. "We'll have to see if we can't manage to get ourselves killed before we land."

Then a murmur in the distance. It was a strange, muted murmur, in nothing resembling the queer notes of the plant men. With Helen clinging to him, Jack explored cautiously, out of the cubby-hole in which they had awaked,

ened. Silence save for that distant murmur. No movement anywhere. Another faint stutter of the rockets, with a distinct accelerative movement of the whole ship. The animal smell grew stronger. They passed through a strangely shaped opening and Helen cried out:

"The animals!"

Heaped higgledy-piggledy were cages from the *Adaura*, little compartments containing specimens of each of the animals which had been bred from for food, and which it had been planned to release if a planet suitable for colonization revolved about Proxima Centauri. Farther on was an indescribable mass of books, machines, cases of all sorts—the materials ordered to be carried to the air lock by the leader of the plant men. Still no sign of any Centaurian.

But the muted murmur, quite incredibly sounding like a human voice, came from still farther ahead. Bewildered, now, Helen followed as Jack went still cautiously toward the source of the sound.

THEY found it. It came from a bit of mechanism cased in with the same lusterless, dull-brown stuff which composed the floor and walls and every part of the ship about them. And it was a human voice. More, it was Alstair's, racked and harsh and half hysterical.

"—you must have recovered consciousness by now, dammit, and these devils want some sign of it! They cut down your acceleration when I told them the rate they were using would keep you unconscious! Gary! Helen! Set off that signal!"

A pause. The voice again:

"I'll tell it again. You're in a space ship these fiends are guiding by a tight beam which handles the controls. You're going to be set down on one of the planets which once contained animal life. It's empty now, unoccupied except by plants. And you and the space ship's

cargo of animals and books and so on are the reserved, special property of the high archfiend of all these devils. He had you sent in an outside-controlled ship because none of his kind could be trusted with such treasure as you and the other animals!

"You're a reserve of knowledge, to translate our books, explain our science, and so on. It's forbidden for any other space ship than his own to land on your planet. Now will you send that signal? It's a knob right above the speaker my voice is coming out of. Pull it, three times, and they'll know you're all right and won't send another ship with preservatives for your flesh lest a priceless treasure go to waste!"

The tinny voice—Centaurian receptors were not designed to reproduce the elaborate phonetics of the human voice—laughed hysterically.

Jack reached up and pulled the knob, three times. Alstair's voice went on:

"This ship is hell, now. It isn't a ship any more, but a sort of brimstone pit. There are seven of us alive, and we're instructing Centaureans in the operation of the controls. But we've told them that we can't turn off the rockets to show their inner workings, because to be started they have to have a planet's mass near by, for deformation of space so the reaction can be started. They're keeping us alive until we've shown them that. They've got some method of writing, too, and they write down everything we say, when it's translated by a dictawriter. Very scientific—"

The voice broke off.

"Your signal just came," it said an instant later. "You'll find food somewhere about. The air ought to last you till you land. You've got four more days of travel. I'll call back later. Don't worry about navigation. It's attended to."

The voice died again, definitely.

The two of them, man and girl, explored the Centaurian space ship. Com-

pared to the *Adastra*, it was miniature. A hundred feet long, or more, by perhaps sixty feet at its greatest diameter. They found cubby-holes in which there was now nothing at all, but which undoubtedly at times contained the plant men packed tightly.

These rooms could be refrigerated, and it was probable that at a low temperature the Centaursians reacted like vegetation on Earth in winter and passed into a dormant, hibernating state. Such an arrangement would allow of an enormous crew being carried, to be revived for landing or battle.

"If they refitted the *Adastra* for a trip back to Earth on that basis, said Jack grimly, "they'd carry a hundred and fifty thousand Centaursians at least. Probably more."

The thought of an assault upon mankind by these creatures was an obsession. Jack was tormented by it. Womanlike, Helen tried to cheer him by their own present safety.

"We volunteered for vivisection," she told him pitifully, the day after their recovery of consciousness, "and we're safe for a while, anyhow. And—we've got each other—"

"It's time for Alstair to communicate again," said Jack harshly. It was nearly thirty hours after the last signing off. Centaurian routine, like Earth discipline on terrestrial space ships, maintained a period equal to a planet's daily rotation as the unit of time. "We'd better go listen to him."

They did. And Alstair's racked voice came from the queerly shaped speaker. It was more strained, less sane, than the day before. He told them of the progress of the Things in the navigation of the *Adastra*. The six surviving officers already were not needed to keep the ship's apparatus functioning. The air-purifying apparatus in particular was shut off, since in clearing the air of carbon dioxide it tended to make the air unbreathable for the Centaursians.

The six men were now permitted to live that they might satisfy the insatiable desire of the plant men for information. They lived a perpetual third degree, with every resource of their brains demanded for record in the weird notation of their captors. The youngest of the six, a subaltern of the air department, went mad under the strain alike of memory and of anticipation. He screamed senselessly for hours, and was killed and his body promptly mummified by the strange, drying chemicals of the Centaursians. The rest were living shadows, starting at a sound.

"Our deceleration's been changed," said Alstair, his voice brittle. "You'll land just two days before we settle down, on the planet these devils call home. Queer they've no colourizing instinct. Another one of us is about to break, I think. They've taken away our shoes and belts now, by the way. They're leather. We'd take a gold band from about a watermelon, wouldn't we? Consistent, these—"

And he raged once, in sudden hysteria:

"I'm a fool! I sent you two off together while I'm living in hell! Gary, I order you to have nothing to do with Helen! I order that the two of you shan't speak to each other! I order that—"

ANOTHER day passed. And another. Alstair called twice more. Each time, by his voice, he was more desperate, more nerve-racked, closer to the bounds of madness. The second time he wept, the while he cursed Jack for being where there were none of the plant men.

"We're not interesting to the devils, now, except as animals. Our brains don't count! They're gutting the ship systematically. Yesterday they got the earthworms from the growing area where we grew crops! There's a guard

on each of us now. Mine pulled out some of my hair this morning and ate it, rocking back and forth in ecstasy. We've no woolen shirts. They're animal!"

Another day still. Then Alstair was semihysterical. There were only three men left alive on the ship. He had instructions to give Jack in the landing of the egg-shaped vessel on the uninhabited world. Jack was supposed to help. His destination was close now. The disk of the planet which was to be his and Helen's prison filled half the heavens. And the other planet toward which the *Adastru* was bound was a full-sized disk to Alstair.

Beyond the rings of Proxima Centauri there were six planets in all, and the prison planet was next outward from the home of the plant men. It was colder than was congenial to them, though for a thousand years their flesh-hunting expeditions had searched its surface until not a mammal or a bird, no fish or even a crustacean was left upon it. Beyond it again an ice-covered world lay, and still beyond there were frozen shapes whirling in emptiness.

"You know, now, how to take over when the beam releases the atmospheric controls," said Alstair's voice. It wavered as if he spoke through teeth which chattered from pure nerve strain. "You'll have quiet. Trees and flowers and something like grass, if the pictures they've made mean anything. We're running into the greatest celebration in the history of all hell. Every space ship called home. There won't be a Centaurian on the planet who won't have a tiny shred of some sort of animal matter to consume. Enough to give him that beastly delight they feel when they get hold of something of animal origin.

"Damn them! Every member of the race! We're the greatest store of treasure ever dreamed of! They make no

bones of talking before me, and I'm mad enough to understand a good bit of what they say to each other. Their most high panjandrum is planning bigger space ships than were ever grown before. He'll start out for Earth with three hundred space ships, and most of the crews asleep or hibernating. There'll be three million devils straight from hell on those ships, and they've those damped beams that will fuse an earthly ship at ten million miles."

Talking helped to keep Alstair sane, apparently. The next day Jack's and Helen's egg-shaped vessel dropped like a plummet from empty space into an atmosphere which screamed wildly past its smooth sides. Then Jack got the ship under control and it descended slowly and ever more slowly and at last came to a cushioned stop in a green glade hard by a forest of strange but wholly reassuring trees. It was close to sunset on this planet, and darkness fell before they could attempt exploration.

They did little exploring, however, either the next day or the day after. Alstair talked almost continuously.

"Another ship coming from Earth," he said, and his voice cracked. "Another ship! She started at least four years ago. She'll get here in four years more. You two may see her, but I'll be dead or mad by to-morrow night! And here's the humorous thing! It seems to me that madness is nearest when I think of you, Helen, letting Jack kiss you! I loved you, you know, Helen, when I was a man, before I became a corpse watching my ship being piloted into hell. I loved you very much. I was jealous, and when you looked at Gary, with shining eyes I hated him. I still hate him, Helen! Ah, how I hate him!" But Alstair's voice was the voice of a ghost, now, a ghost in purgatory. "And I've been a fool, giving him that order."

Jack walked about with abstracted, burning eyes. Helen put her hands on



his shoulders and he spoke absently to her, his voice thick with hatred. A desperate, passionate lust to kill Centaursians filled him. He began to hunt among the machines. He became absorbed, assembling a ten-kilowatt vortex gun from odd contrivances. He worked at it for many hours. Then he heard Helen at work, somewhere. She seemed to be struggling. It disturbed him. He went to see.

She had just dragged the last of the cages from the *Adastra* out into the open. She was releasing the little creatures within. Pigeons soared eagerly above her. Rabbits, hardly hopping out of her reach, munched delightedly upon the unfamiliar but satisfactory leafy vegetation underfoot.

She browsed. There were six of them besides a tiny, wobbly-legged lamb. Chickens pecked and scratched. But there were no insects on this world. They would find only seeds and green stuff. Four puppies rolled ecstatically on scratchy green things in the sunlight.

"Anyhow," said Helen defiantly, "They can be happy for a while! They're not like us! We have to worry! And this world could be a paradise for humans!"

Jack looked somberly out across the green and beautiful world. No noxious animals. No harmful insects. There could be no diseases on this planet, unless men introduced them of set purpose. It would be a paradise.

THE MURMUR of a human voice came from within the space ship. He went bitterly to listen. Helen came after him. They stood in the strangely shaped cubby-hole, which was the control room. Walls, floors, ceiling, instrument cases—all were made of the lusterless dark-brown stuff which had grown into the shapes the Centaursians desired. Alstair's voice was strangely more calm, less hysterical, wholly steady.

"I hope you're not off exploring

somewhere, Helen and Gary," it said from the speaker. "They've had a celebration here to-day. The *Adastra*'s landed. I landed it. I'm the only man left alive. We came down in the center of a city of these devils, in the middle of buildings fit to form the headquarters of hell. The high panjandrum has a sort of palace right next to the open space where I am now.

"And to-day they celebrated. It's strange how much animal matter there was on the *Adastra*. They even found horsehair stiffening in the coats of our uniforms. Woolen blankets. Shoes. Even some of the soaps had an animal origin, and they 'refined' it. They can recover any scrap of animal matter as cleverly as our chemists can recover gold and radium. Queer, eh?"

The speaker was silent a moment.

"I'm sane, now," the voice said steadily. "I think I was mad for a while. But what I saw to-day cleared my brain. I saw millions of these devils dipping their arms into great tanks, great troughs, in which solutions of all the animal tissues from the *Adastra* were dissolved. The high panjandrum kept plenty for himself! I saw the things they carried into his palace, through lines of guards. Some of those things had been my friends. I saw a city gone crazy with beastly joy, the devils swaying back and forth in ecstasy as they absorbed the loot from Earth. I heard the high panjandrum hoot a sort of imperial address from the throne. And I've learned to understand quite a lot of those hootings.

"He was telling them that Earth is jacked with animals. Men. Beasts. Birds. Fish in the oceans. And he told them that the greatest space fleet in history will soon be grown, which will use the propulsion methods of men, our rockets. Gary, and the first fleet will carry uncountable swarms of them to occupy Earth. They'll send back treasure, too, so that every one of his sub-

pects will have such ecstasy, frequently, as they had to-day. And the devils, swaying crazily back and forth, gave out that squealing noise of theirs. Millions of them at once."

Jack groaned softly. Helen covered her eyes as if to shut out the sight her imagination pictured.

"Now, here's the situation from your standpoint," said Alstair steadily, millions of miles away and the only human being upon a planet of blood-lusting plant men. "They're coming here now, their scientists, to have me show them the inside workings of the rockets. Some others will come over to question you two to-morrow. But I'm going to show these devils our rockets. I'm sure—perfectly sure—that every space ship of the race is back on this planet."

"They came to share the celebration when every one of them got as a free gift from the grand panjandrum as much animal tissue as he could hope to acquire in a lifetime of toil. Flesh is a good bit more precious than gold, here. It rates, on a comparative scale, somewhere between platinum and radium. So they all came home. Every one of them! And there's a space ship on the way here from Earth. It'll arrive in four years more. Remember that!"

An impatient, distant hooting came from the speaker.

"They're here," said Alstair steadily. "I'm going to show them the rockets. Maybe you'll see the fun. It depends on the time of day where you are. But remember, there's a sister ship to the *Adaura* on the way! And Gary, that order I gave you last thing was the act of a madman, but I'm glad I did it. Good-by, you two!"

SMALL hooting sounds, growing fainter, came from the speaker. Far, far away, amid the city of fiends, Alstair was going with the plant men to show them the rockets' inner workings. They wished to understand every aspect of the

big ship's propulsion, so that they could build—or grow—ships as large and carry multitudes of their swarming myriads to a solar system where animals were to be found.

"Let's go outside," said Jack harshly. "He said he'd do it, since he couldn't get a bit of a machine made that could be depended on to do it. But I believed he'd go mad. It didn't seem possible to live to their planet. We'll go outside and look at the sky."

Helen stumbled. They stood upon the green grass, looking up at the firmament above them. They waited, staring. And Jack's mind pictured the great rocket chambers of the *Adaura*. He seemed to see the strange procession enter it; a horde of the ghastly plant men and then Alstair, his face like marble and his hands as steady.

He'd open up the breech of one of the rockets. He'd explain the disintegration field, which collapses the electrons of hydrogen so that it rises in atomic weight to helium, and the helium to lithium, while the oxygen of the water is split literally into neutronium and pure force. Alstair would answer hooted questions. The supersonic generators he would explain as controls of force and direction. He would not speak of the fact that only the material of the rocket tubes, when filled with exactly the frequency those generators produced, could withstand the effect of the disintegration field.

He would not explain that a tube started without those generators in action would catch from the fuel and disintegrate, and that any other substance save one, under any other condition save that one rate of vibration, would catch also and that tubes, ship, and planet alike would vanish in a lambent purple flame.

No; Alstair would not explain that. He would show the Centaurians how to start the Caldwell field.

The man and the girl looked at the

sky. And suddenly there was a fierce purple light. It dwarfed the reddish tinge of the ringed sun overhead. For one second, for two, for three, the purple light persisted. There was no sound. There was a momentary blast of intolerable heat. Then all was as before.

The ringed sun shone brightly. Clouds like those of Earth floated serenely in a sky but a little less blue than that of home. The small animals from the *Adastra* munched contentedly on the leafy stuff underfoot. The pigeons soared joyously, exercising their wings in full freedom.

"He did it," said Jack. "And every space ship was home. There aren't any more plant men. There's nothing left of their planet, their civilization, or their plans to harm our Earth."

EVEN out in space, there was nothing where the planet of the Centaurians had been. Not even steam or cooling gases. It was gone as if it had never existed. And the man and woman of Earth stood upon a planet which could be a paradise for human beings, and another ship was coming presently, with more of their kind.

"He did it!" repeated Jack quietly. "Rest his soul! And we—we can think of living, now, instead of death."

The grimness of his face relaxed slowly. He looked down at Helen.

Gently, he put his arm about her shoulders.

She pressed close, gladly, thrusting away all thoughts of what had been. Presently she asked softly: "What was that last order Alstair gave you?"

"I never looked," said Jack.

He fumbled in his pocket. Pocket-worn and frayed, the order slip came out. He read it and showed it to Helen. By statutes passed before the *Adastra* left Earth, laws and law enforcement on the artificial planet were intrusted to the huge ship's commander. It had been specially provided that a legal marriage on the *Adastra* would be constituted by an official order of marriage signed by the commander. And the slip handed to Jack by Alstair, as Jack went to what he'd thought would be an agonizing death, was such an order. It was, in effect, a marriage certificate.

They smiled at each other, those two. "It—wouldn't have mattered," said Helen uncertainly. "I love you. But I'm glad!"

One of the freed pigeons found a straw upon the ground. He tugged at it. His mate inspected it solemnly. They made pigeon noises to each other. They flew away with the straw. After due discussion, they had decided that it was an eminently suitable straw with which to begin the building of a nest.

## "I NEVER HAD SUCH A SMOOTH SHAVE"

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# NO MEDALS

by Leigh  
Keith



**I**N HIS workshop Patrick Finch was capable of almost any extent of endurance. He had known stretches of research during which he had labored more than two days at a time, and gone to bed tired but with a clear head and eyes and hands reasonably steady.

He paced back and forth.

The room was fairly large and held only two straight-backed chairs and a leather-covered operating table, yet he repeatedly walked into the few pieces of furniture. The pain of his barked shins did little to calm him.

He never was any good at this sort

of thing. Give him a workshop and a problem, leave him completely in seclusion, and he would bring forth the answer in concrete, workable form. That is, if it pertained to the mechanics of medical engineering. But let him beg for assistance or attempt to sell an invention of his and he would bog in a mire of sheer nervousness.

There was the time he had taken a breather from his masterpiece, his life work. The result was an instantaneous, automatic bone setter that set a bone so quickly there was no necessity for anesthesia, and poured an exact amount of plaster for the cast, needing no complicated calculations for the difference in setting and the contraction of the limb during the mending process.

The navy had a remote direction control for their torpedoes. That was his. While experimenting with remote control through broad and narrow radio beams, attempting to find the cheapest method of mass control, he attached a movable rudder to a torpedo and harnessed it to a control set.

There were other things; those he could dismiss easily.

His life work was a different matter. Even the minister of war could not expect a man to give up the product of years of work and study without a struggle. Patrick Finch would not only fight like a demon to protect his discovery—he would squeeze the last penny out of the government in payment.

Well, why not? The number of years and the amount of money invested could be dispensed with as argument. Consider, instead, the deaths and tremendous slaughter the government was sustaining during this war. If he had the secret to victory, was it not worth all he asked for it?

But of course he had to consider what it would mean to him. In spite of his nervousness, he realized perfectly the importance of the visit from the min-

ister of war. Of course his hands shook and he feared intensely the touch and go, the commercial bickering and haggling, the possibility of being cheated and—

Almost every penny he had was gone. For days—ever since he had received the reply from the minister of war appointing this day as the one for the demonstration—he had been forced to live on bread and milk. Further research was impossible unless he could get a pension from the war department.

Perhaps they would treat him right, now. It was time. And the minister of war certainly knew who he was.

He wandered over to the operating table, wondering how he could avoid being cheated by the shrewd minister of war. Finch never could understand the workings of a business deal, therefore he had asked in return for his discovery merely a life pension, sufficient to pay for further researches.

His eyes gleamed triumphantly as he stared down at the weird, unnatural corpse, with thin bright wires leading to its skin, lying on the operating table. Twenty-three years of work—but it was done!

There was no need for repartee, nor for the construction of a complete scene with provisions for loopholes and all. The invention was startling enough, and so evidently efficient, it required no assistance from him in the form of salesmanship. Besides, if they wanted it, nothing he did or said would change their minds for them. And one demonstration was all they would need—

FOR his purpose, life is an electrical impulse. More clearly than that such a simple statement of the fact cannot be expressed, until the nature of electricity is established.

Volition, then, implies a charge of electricity. The desire to raise the right arm is realized by an almost undetectable charge emitted by the brain and carried

along a nerve to the flexion muscles of the upper arm and shoulder. The minute electrical impulse contracts certain portions of the muscle and permits other portions to relax from their normal tension, with the result that the arm is raised.

In that case the brain can be considered as a storage battery. Voluntary and involuntary movement of other parts of the body are effected in the same way—by an electrical charge varying from .0004 amperes to .0009 depending upon the intensity of the muscular effort.

The manner in which the brain generates electricity is unknown. For Finch's purpose, however, that was unimportant. So long as the charge of current can be induced artificially, the organic method is unimportant.

Twenty-three years before, he had conceived the principle.

He bought his first cadaver, necessarily fresh so the nerves would still be perfectly intact. Working at a laboratory routine job, he did his private experimentation at night, tracing the nerves from the brain to the muscles.

The substitution of thin silver wire for nerves took years, until he realized the substitution was unnecessary for the most part, except those nerves that control the process of locomotion.

He stood looking down at the cadaver. On its back, between the shoulder blades, was a flat metal box with wires leading from it into the skin. A tiny antenna, supported by two metal rods, was suspended across the side.

Five silver wires led into each shoulder and arm: one to the deltoid muscle of the acromial region, another to the coraco brach, under the upper arm, controlling the simple raising of the arm; another to the bicipital fascia, controlling the bending at the elbow; one to the brachioradialis, the forearm; the last to the flexor carpi radialis, the clenching and laxing of the fingers.

An electrical impulse could be sent along each wire or all at once.

To the hip: gluteus maximus, medius and minimus; pyriformis; and to the leg: the tibialis antrius, extensor proprius hallucis, the extensor longus digitorum, all controlling the raising of the leg and the bending at the knee.

These also could be controlled individually or collectively.

In this way he dispensed with the brain altogether, making of the body a simple machine of locomotion.

Over a hundred thousand soldiers, from his country alone, had been killed during the war. Under present conditions an official telegram of condolence to the deceased's family, burial, and a simple grave marker finish the business. He would revolutionize that. The soldier's usefulness to his country would not end with death.

He held a small radio set between his knees. It glowed with tubes, underneath which were levers contacting pressure points, graduated according to the electrical charge desired.

As he advanced a lever, the receiving set strapped on the cadaver's back received the impulse. The result was a charge of current sent along a thin wire to the arm, which doubled under the body and straightened out stiffly, lifting the body to a sitting position. Another lever lifted the legs over the side of the table.

The cadaver stood on its own legs, swaying only slightly. And as he pushed lever after lever, it walked slowly to a layonet in the corner, gripped it in its stiff fingers, and obeyed his commands to thrust and parry the keen knife at invincible enemies.

IT WAS NIGHT at the front. Everything was silent—no airplanes flew overhead, for antiaircraft stations, capable of picking up the sound of the most muffled engine, trained deadly guns on the plane automatically, having de-



terminated, also automatically, the height and distance of the aircraft without error. A few star-shells intermittently lighted the ravaged, desolate battle country, torn with regular scars of deep muddy trenches. The heavy artillery stationed far behind the trenches were silent.

False dawn was lighting the smoky sky. It was a little past four in the morning.

Hordes poured over the trenches. A moment while they lined one deep before the narrow cicatrices. Then silently, except for the watery *slug slug* of heavy boots in the thick mud, they rushed in perfect formation toward the line of charged barbed-wire fence marking no man's land.

Behind, seated comfortably at switchboards, men held calm hands on levers, eyes fixed on maps. The horde of silent soldiers, tall and short, moved at precisely the same rate of speed—so many feet at each pace, so many paces to cover a certain distance.

A gong sounded brazenly in the large bombproof dugout. Levers advanced to the last notch for a brief second, then shot back to the third pressure point.

The five-foot wire fence offered no obstacle to the rushing line of solid phantoms. They cleared it at a bound, taking the uneven ground in no man's land without stumbling.

Lookouts stationed in the first line of the enemy's trenches shouted hoarsely their warnings and hurled grenades as the soldiers cleared the second fence and dashed wildly on toward them.

The grenades detonated, tearing hundreds of them apart. They fell as silently as they had advanced. The others ran on, unhesitating.

Now they reached the trenches and jumped simultaneously. Some landed on bayonet points. The enemy soldiers were astonished because no cry of pain came from them.

The clash of bayonet on bayonet—

They hacked and parried and stabbed, and in turn were stabbed in mortal places, but stood firmly, still parrying and stabbing.

Terrorized, those of the enemy who had not been hacked to pieces, threw down their bayonets and clambered fearfully out of the hell pits of maniacal furor. Their assailants still hacked and ripped at the air.

Immediately, though, the trenches were cleared and the silent straight line followed swiftly after them. The second, the third, the fourth lines of trenches were completely wiped out of those of the enemy's soldiers who preferred attempting to save the ground instead of running madly away from the deadly, unkillable robots.

And when the last line had been reached, shrieking mobs of triumphant soldiers scrambled across no man's land to seize the captured trenches.

The silent horde had done its work.

Now, silently as they had come, they turned around at one movement and headed back in a fleet rush. The oncoming soldiers halted and stood out of their way as they cleared at a bound the charged barbed-wire fence.

Back once more in their own territory, they slowed down and marched into an enormous dugout. A selenium eye counted them as they broke the shaft of light. They placed their bayonets carefully in racks and marched into the main room of the gigantic dugout. Without pausing, each mounted a ladder and tumbled into a vat smelling intolerably of formaldehyde.

Outside, at the captured trenches, soldiers furiously dragged bodies out into ravaged ground, near the wire fences. A star shell exploded over no man's land. They worked still more rapidly. Another star shell— They hurried back in confusion. A pause of several seconds—

Muffled detonations tore the bodies apart.

The men at the switchboards stood up. Overhead was the rumble of artillery moving up toward the new front.

There were no medals—no honors for distinguished service—no heroic sacrifices—

But it was most efficient.

SO PATRICK FINCH dreamed as he played with his levers and watched the dreadfully silent automaton wield its bayonet with deadly skill. One hundred thousand dead soldiers—

One hundred thousand deadly attackers!

Victory for his country—a life pension for him!

He considered seriously, letting his fingers idly control the levers. While the automaton continued stabbing at the air, advancing and withdrawing on noiseless feet, he figured the rapidity with which the government would be able to enter the borders of silent soldiers—

A casual tactical blunder of the intelligence department would account for any number of deaths—from a few thousand to whole battalions. The more deaths, the better, of course.

A couple of hundred skilled surgeons could then take the un mutilated cadavers and, in a few minutes, sew the wires from the receiving sets through the flesh to the proper muscles.

The most efficient army the world has

ever seen, accomplished in less than a week. No rations needed; no fear of lack of discipline; no worry over unavoidable casualties—

In spite of lack of money, arms, and men, his country could still win. With his aid alone, naturally. His inherent desire for praise saw honors, medals, scientific fellowships, national worship for the one man who alone had saved his country: Patrick Finch!

Simply a matter of course—

A hundred men, or a thousand, or ten thousand could obey the command of his levers as effortlessly as one.

The automaton wheeled silently as his nervous hands clutched at the lever in an excess of delight at the vision of future honors. Swinging its bayonet powerfully from side to side, it rushed down on him. The vacant eyes in the shriveled head saw nothing.

He felt the first stab and nothing more.

THERE were no medals, no honors for distinguished service—

And there continued the present conditions: an official telegram of condolence to the deceased's family, military burial, and a simple grave marker. The soldier's usefulness to his country ended with his death.

His country could expect no more from him than that.

<p><b>HERE'S THE AID TO FEWER COLDS... VICKS VA-TRO-NOL</b> • A FEW DROPS UP EACH NOSE •</p>	<p><b>HERE'S THE AID TO SHORTER COLDS ...VICKS VAPORUB</b> • JUST RUB ON THROAT AND CHEST •</p>
	
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# When the Sun Dies

*Science faces its problems as they arise but here came a time when ingenuity was strained to its uttermost*

by Chan Corbett

IN THE YEAR 1981 A. D., as time was reckoned in the Pre-Catastrophe Era, the Sun entered upon its final stage of devolution. It began ordinarily enough. A few irregular shaped spots made their appearance in the usual belts, ranging from ten to thirty degrees north and south of the equator. Astronomical observatories thereupon duly set up their spectroheliographs, took innumerable photographs, and went through their regular routine of work.

Everything was perfectly normal and in accordance with rule. Every eleven years, after a period of quiescence, another Sun-spot cycle was due to begin, and the year 1981 had long been marked on solar calendars as just another of these initiatory periods.

The astronomers yawned and checked their plates, made intricate calculations. There was absolutely nothing out of the way. The spectrum of titanium oxide showed its somber lines in the absorption plates, proving the temperature of the spots to be less than six thousand degrees centigrade, but then that, too, was nothing unusual. Titanium oxide had been in the habit of making its appearance in Sun spots ever since the first spectrum had been observed.

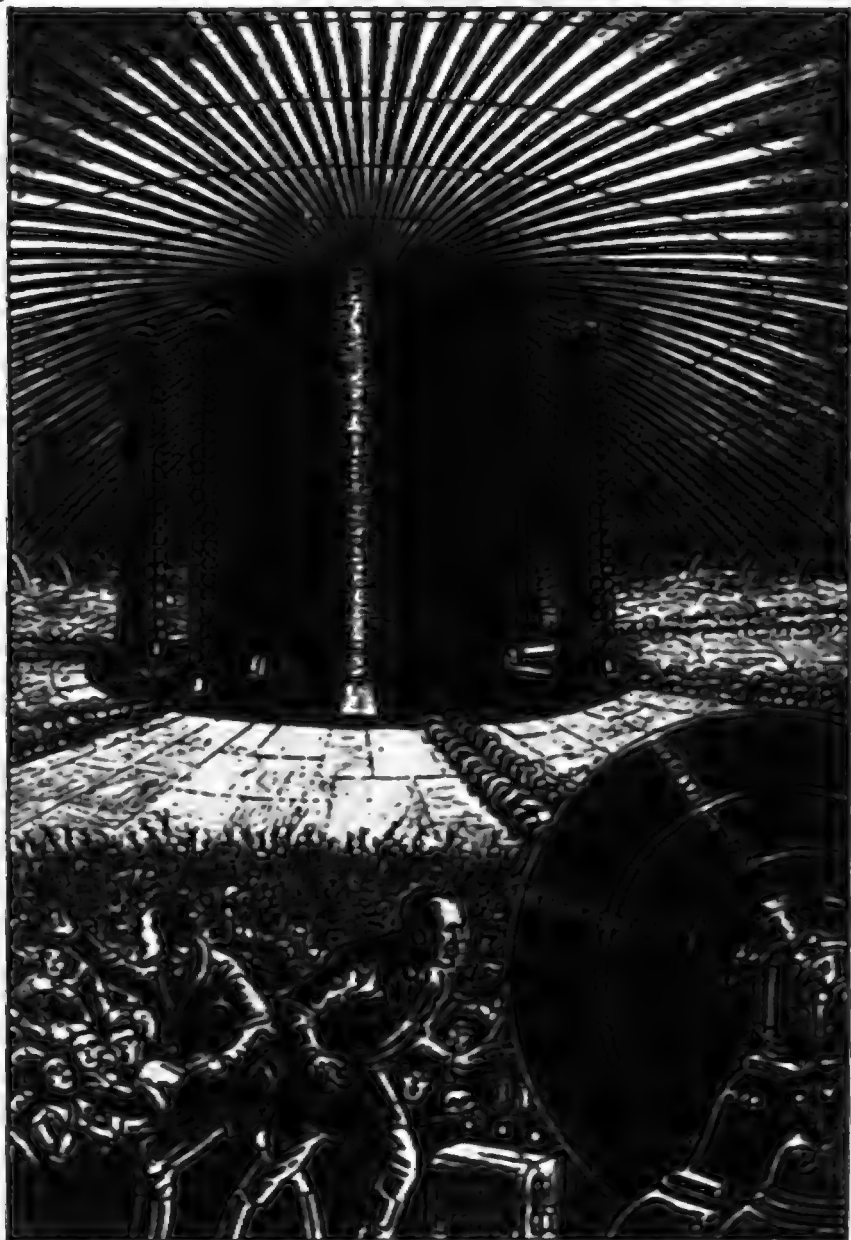
The world at large certainly was totally disinterested. It left those matters to the scientists, though some of the

newscasters in their popular educational chats mentioned the phenomena briefly and then went on with audible relief to weightier and more engrossing matters.

For the next two years the Sun spots increased in number and in range. There was nothing alarming about that, either. Sun-spot cycles had a habit of reaching maximums before fading completely out of the picture.

During the third year, here and there, an astronomer ventured upon certain cautious statements in the privacy of his own kind. The spots were swarming now, larger and more numerous than ever before. Some were a hundred thousand miles across, and they pressed down toward the equator, where only on rare occasions had they ever appeared.

But by the beginning of the fourth year, to wit, 1985, the indubitable phenomenon of his Majesty, King Sol, was unwillingly forced upon the attention of even the sky-polo fans. The Sun-spot areas had spread into sacrosanct territory, notably, the region of the solar poles. This in itself was unheard-of. Furthermore, they had grown so enormously in size that they obscured major portions of the Sun's surface. No longer was the lord of the planetary system a dazzling effulgence, on whose regal countenance none might look and live unblinded. Its appearance grew wan



*Too late the engineer switched off the babbling operator. The hysterical voice had seared through the huddled multitude like a flame.*

and darkly red, and the light he cast upon his subject worlds was shorn of its former wonder-working influence.

**IT GREW COLD.** The summer of 1985 was notable for its low temperatures and occasional flurries of snow. Crops grew only under the greatest of difficulties, and in the more northern regions were completely blighted by frost. For the first time in the memory of man the yields of staple foods were considerably less than sufficient to feed mankind.

A still colder winter loomed ahead. The astronomers huddled in innumerable conferences, and the sum totals of their sessions were solemn announcements that unknown internal forces had evidently blanketed the Sun's surface with a comparatively cool layer of swirling gases, which acted as an efficient absorbent for the still unimaginably hot interior.

How long this disastrous state of affairs would last the astronomers had no means of determining, but they concluded with the pious hope that it would be a purely temporary condition, not a permanent eclipse.

But John Hammond knew better. He was an engineer and physicist of note, and he had just been awarded the Nobel Prize in Physics for the discovery of a new alloy, marvelously light and marvelously strong. Even his own precision instruments had been unable to measure the limits of its tensile strength and elasticity. When, therefore, in his laboratory at General Metals, he read the latest report of the astronomers to the effect that iron had already liquefied in the area of the Sun spots, he knew it would soon be too late.

Whereupon, with his accustomed energy, he acted at once. He communicated with a picked group of men and women, the flower of the race, famous in science, literature, the arts, and kindred fields, and explained what he in-

tended to do. In certain cases he met with rebuffs; in some he was treated as a madman.

But the fall of 1985 was merciless. Zero weather was almost a daily occurrence; the Sun was a pallid disk that rose and set each day, yielding little light and less heat. A permanent dimness spread its mantle over the world, and the days were divided from the nights only by a reddish glow.

Gales of tremendous proportions raged over land and sea. Only the largest of the electrically driven submersible ships were able to brave the ocean's wrath, and then only by scuttling along at depths of more than a hundred feet. Hardy aviators, buffeted and torn by howling blizzards, reported that the great ice packs of the northern and southern seas were growing visibly from hour to hour; that already the polar ocean was frozen as far south as Labrador.

Food was being hoarded by a frightened populace. All the frantic efforts of the World Council were barely able to ration the scanty crops among a starving people. There were riots, and smashed storehouses, and fires in large cities that could not be controlled, because the water systems were conduits of ice. Thousands died of cold and starvation.

Already the northern climes were being evacuated. Millions of heart sick, frostbitten refugees jammed the airways and the supertunnels that led to the equatorial areas. There they were met with bayonets and flame guns. There was not room enough for both natives and the impouring flood, and self-preservation is the first law of existence. The refugees could not go back. There was no habitable place to which to return, and all available transportation was jammed with new floods.

Whereupon, in desperation, they threw themselves upon the glistening steel and the searing blasts of the pro-

jectors. Riots developed into battles, battles into wars, and wars gave way to an elemental savagery. Millions died for a foothold in a land where already the tropical breezes held an ominous chill, where the Sun even at high noon cast a barely perceptible shadow.

But John Hammond was furiously at work. He surrounded himself with a corps of devoted assistants. Night and day, in the electrically heated plant near Pittsburgh, he wrought out countless tons of the new *Hammondite* alloy. He ranged a fast-freezing world with swift fliers, buying and transporting great stores of materials and supplies to a certain territory in northern Alabama, which he had personally surveyed and prospected. Here were coal and iron deposits and oil-bearing shale in abundance. His picked one thousand men and women, now fully aware of their peril, hastened to the refuge from all over the world.

Twenty-four hours a day they toiled, fantastically clad in furs, pooling their resources and knowledge in a race against time. John Hammond was a tornado of energy, planning, building, exhorting, yet always calm, always with an eye cocked at the ever-darkening disk of the Sun. They worked in freezing rains, and they worked in arctic blizzards; they slept in their clothes and they ate in haste and sparingly. Gigantic machines thundered and roared, and made a blood-red inferno with their fiery maws and belching stacks.

Yet it speaks volumes for John Hammond that, in spite of the tremendous need for haste, he sponsored other and similar groups to his own, advised and coordinated their work, supplied them with reckless generosity of the stores of precious *Hammondite* that his plant, now in the midst of arctic wilderness, continued ceaselessly to turn out.

BY NOW the world knew it was doomed. Even if the unexampled Sun-

spot cycle was but a temporary condition, there would be no one left on Earth to observe its relaxation. The last bolometer reading showed the temperature of the Sun's photosphere to be 2200 degrees centigrade; and it was falling at a daily uniform rate.

Canada, northern Europe, and Asia were completely abandoned. Only the wolves shivered and howled in the interminable wastes of snow and fed hungrily on the frozen carcasses of those who had been unable to join the mad southward migrational rush.

The oceans were a solid ice pack down to the Gulf of St. Lawrence and into the North Sea. Inasmuch as water expands on freezing by approximately one twelfth of its volume, millions of additional cubic miles of matter were crowded into ocean beds intended to accommodate that much less, with inevitable results.

The tremendous ice pack reared itself mile-high into the frozen air, precipitated itself into one vast glacier over protesting continents. Interminable icebergs ground themselves off the edges, and went toppling and tumbling into the southern seas. Huge tidal waves inundated the most remote shores and carried millions of people to destruction.

New York, Philadelphia, Hongkong, Rio de Janeiro, Athens, Marseilles, Cape City, all lay under fifty feet of water. The cold, storm-tossed seas surged inland as far as the Alleghenies along the eastern seaboard of the United States.

John Hammond lashed his laboring thousand on to even more furious efforts when he heard the news. He had anticipated all this. They were about to enter a new Glacial Age, the duration of which he dared not forecast. It might be the eleven years of normal Sun-spot cycle, and it might be— He shook the thought out of his mind. That way lay madness.

Even if the temperature of the Sun's

photosphere should fall no lower than 2000 degrees centigrade, the amount of heat radiated to the Earth would be so little that the Earth's surface would be not much above the absolute zero of space. Naturally, all life would cease to exist. The oceans would become one vast and solid expanse of ice. It was even within the bounds of possibility that the atmosphere itself might liquefy.

Hammond had already calculated the results. The total area of the Earth's seas approximated 140,000,000 square miles, and the mean depth was slightly over two miles. Hence, more accurately, the total volume of water covering the face of the globe was 320,000,000 cubic miles. The rest was a simple problem in arithmetic. If water on solidifying into ice expanded by one twelfth, then there would be an excess of some 26,600,000 cubic miles of ice.

This excess, from the laws of glacial flows, would tend to distribute itself fairly evenly over the face of the planet—a superficial area of some 197,000,000 square miles. In other words, a vast glacier would completely bury the Earth to a depth of about seven hundred feet. But this calculation was on the assumption that the globe is a plain. Allowing for mountain masses and high plateaus, the figures came to over a thousand-foot depth for the more level areas.

It might be questioned then whether Hammond had not made a fatal blunder in choosing the comparatively low hills of northern Alabama for his project, instead of transporting his chosen band to the high mountaintops or to the plateaus of Tibet and the Gobi. There they would be above the enveloping glacier, and the construction problem would have been radically simpler.

That, of course, is true. The site he had finally adopted, after careful examination, was only some four hundred and fifty feet above sea level and would be buried under the ultimate glacier to a depth of over five hundred feet. But

there were several considerations that led to this seemingly egregious error.

In the first place there were only a few spots on the face of the Earth that contained within a necessarily small circumscribed area such essentials as food, coal, natural gas, and oxygen-bearing rock. They were all here in abundance. Furthermore, he had discovered on hand less essential, but still vitally important, deposits of lead, tin, aluminum, titanium, and beryllium. The last two were used in the manufacture of Hammondite.

In the second place, the whelming ice pack would retain its residual heat for years, and thus temper to the colony beneath the unutterable cold of outer space. Of course, if the Glacial Age were of indefinite duration, or if the Sun had permanently become a dark star, that would not matter very much. But then, in that event, Hammond would not have lifted a finger. Far better to die at once and now than to eke out for generations a miserable, under-world existence, until the inevitable exhaustion of minerals, power, so forth, would bring hideous strangling deaths to their children or children's children. He was gambling on a long chance, and he did not hesitate. It was the only way to save the human race and its civilization, such as it was, from utter extinction.

## II.

BY JANUARY of 1986 it was almost impossible to work outdoors. The ethane thermometers showed a steady temperature of fifty below zero Fahrenheit. But that was not all. The gales were ripping over an ice-blanketed Earth at velocities exceeding a hundred miles an hour. The Sun was a dim red ball, giving neither warmth nor light. The frozen stars and a cold pale Moon accompanied the dying monarch in its slow marches across the heavens.

Fortunately, however, the gigantic



dome was already inclosed. Its diameter was one mile and it sprang in a great rounded arch some five hundred feet into the air. Hammond utilized all his engineering ability to buttress the soaring curve against the millions of tons pressure that he anticipated would be exerted against it. The *Hammondite* plates of the outer skin were ten feet thick and gleamed like a silver sheen.

A huge central shaft, five hundred feet in diameter, and hollow inside, thrust its rounded smoothness from the midpoint of the inclosure to the topmost point of the dome. Its base was solidly embedded in rock one hundred feet beneath the ground. It served a double purpose. It helped support the great arch, and within its huge interior most of the machinery necessary to run the buried city could be installed.

By February all of the supplies were moved inside, and emergency-heating equipment gave fairly adequate warmth while the work went on at accelerated speed. Already the snow had banked in solid packs against the outer walls for depths of twenty feet. There was no let-up in the blizzards that now continuously obscured the heavens. Wind velocities attained two hundred miles per hour. The temperature dropped to over eighty below.

It was late June before Hammond heaved an almost regretful sigh and indicated to his thousand that the installation was complete. A holiday was declared and tours of inspection made. No one but Hammond had been able to grasp the whole scheme entire during the course of construction.

Now for the first time they could see as a finished product the pitifully confined walls of their prison through—would it be years, centuries, or eternity? Mingled with the exclamations of awe and wonder at this supreme manifestation of the essential genius of the human spirit were sundry half-concealed well-

ings of tears in the eyes of the more emotional.

Even Hammond was a bit grim at the thought of the future, and more than a bit anxious at the thought that he might have overlooked something in this subglacial city. Mistakes or oversights unfortunately could never be remedied. The tiniest flaw might lead to complete disaster for the thousand—and for the chance of the human race to survive. Only the young men and women among them, bright with the irrepressible optimism of youth, looked on the whole affair as a gigantic adventure and felt privileged to be participants.

But the city, which Hammond christened "*Glacida*" with appropriate ceremonies, was in truth the crowning projection of thousands of years of science. The sheathing of the dome was *Hammondite*, ten feet thick, in two layers, between which rested a thick weave of an asbestoslike material, with an insulating efficiency of ninety-four per cent. Hammond applied what corresponded to a pressure of 10,000,000 tons to the square inch on this sheath without result. This would be far greater than the calculated mass of glacier that would bear down on the buried city, even if the atmosphere should liquefy above them.

Light was supplied by a series of gigantic floodlights that sent millions of candle power from their hyperbolic reflectors against the arch of the great dome and diffused a soft, even illumination throughout the concavity. The light was indistinguishable from the glow of normal daylight, and it was rich in those ultra-violet rays which are requisite for good health and the active functioning of the human body.

Earth time was rigidly adhered to, with its division into seconds, hours, days, years. For a period of eight hours each day the lights were cut off, except for certain necessary purposes. This was the sleep period.

Heat was radiated from the central shaft at a constant temperature of seventy-five degrees Fahrenheit. Inasmuch as the insulation of the shell was almost perfect, very little energy was required to maintain this warmth.

A breathable atmosphere, of course, was the most vital and most complicated problem. But Hammond worked it out satisfactorily. One of the reasons he had picked this particular spot was the presence of a large deposit of beryls, or barium oxide, underlying the surface. Simple heat was sufficient to release the combined oxygen. Nitrogen, as the inert element in normal atmosphere, was not much of a problem. It remained in fairly constant quantities. The artificial air was passed through finely powdered dehydrated soda lime and calcium chloride to remove the exhaled carbonic-acid gas and other products of disintegration. Furthermore, growing plants, essential for other purposes, also helped to establish a natural breathing cycle by absorbing the carbonic-acid gas and emitting oxygen in its place.

WATER, the next most important item of an inclosed economy, was the simplest proposition of all. The engulfing glacier would supply that in unlimited quantities. Food required a great deal of careful planning. For the immediate present, Hammond had assembled tremendous stores of perishable supplies; tinned goods of every description, and frozen beef that would keep indefinitely in subterranean cellars. He had, he calculated, a sufficient supply on hand to last the thousand and their natural increase for a period of fifteen years.

But if their captivity should not end by then, if it should prove eternal—carefully as he concealed that latter possibility from his devoted band, he himself had to face it—a perpetual food source must be provided.

Accordingly, over the insulated Ham-

mondite floor which he had laid for his city, he spread a layer of rich black humus and top soil to a depth of twenty feet. Every inch of space, not taken up by buildings and machinery, was placed under careful cultivation. The essential grains—wheat, rye, corn, and oats, were grown, as well as the garden greens—carrots, peas, beans, spinach, so forth. Fruit trees were planted—apples, peaches, plums, oranges, lemons. A small area was set aside for milch cows, pigs, and chickens, and sown with grass and clover for pasture.

Every item was planned to the last detail for an economy of some twelve hundred persons. Here, under carefully regulated conditions, there could be no question of droughts or storms or failure of crops. The natural droppings of the animals were used for fertilizer to renew the exhausted soil, and nitrogenous products were also released from a small vein of calcium nitrate that interpenetrated the coal beds.

From the mines, into which tunnels were bored and sheathed immediately with insulated *Hammondite*, came iron, aluminum, beryllium, and titanium, together with small amounts of tungsten, silver, lead, tin and zinc. There would be no lack of metals. For power there were extensive coal deposits and a huge pocket of natural gas. The coal was burned underground and converted into steam and electricity, and all smelting operations were likewise conducted in the depths, and the waste gases led through pipes into the outer glacier.

The by-products of coal distillation gave dyes, medicinal products, and a synthetic rubber which a committee of chemists among the refugees had managed to evolve. Even fabrics were fashioned from the coal tar, very glossy and very durable.

Geologists among them estimated that the gas and coal formations would probably suffice for all power and heating needs for at least five hundred years.

After that—well, either the colony would have discovered the secret of atomic power, or else—

The central shaft contained, as has been said, all the necessary machinery that could not be installed within the mines. Gigantic motors purred, dynamos whined, steam turbines made small hissing sounds, and an infinitude of complicated electrical apparatus sparked continually. On the constant, unremitting functioning of these machines depended the lives of the prisoned colony, the whole future of the human race.

Laboratories were installed—chemical, physical, biological, metallurgical. Highly trained technicians pored over their problems, worked ceaselessly in the search of functional improvements. The several astronomers wandered sadly about in this plethora of scientific equipment. There was no place for them. Not for the naturalists. It was a saddening thought that only the few domestic animals within the gates could hope to survive the cataclysm.

LIVING quarters were arranged in four tall, narrow-founded buildings grouped around the central shaft. Space was at a premium, and they soared longitudinally almost to the inclosing roof. Two of the buildings were for married couples and their children; one for bachelors, and one for as yet unwedded girls.

The problem of offspring was worked out with considerable detail and delicacy. The city of Glacida could accommodate comfortably about twelve hundred people, but no more. Births, therefore, had to be regulated to offset a definite mortality rate. Rigid sanitary conditions, unremitting medical attention, and germ-proofed air, made deaths from other than old age and accidental causes a rarity.

The ceremonies accompanying completion lasted a day. After that the planned routine would begin. There

was considerable jollification among the younger set, and heavy, though indomitable hearts among the older and more wise. Peer as hard as they could into the future, they could not fathom their fate. The Sun had, for some strange reason as yet incomprehensible, masked its fires with layers of cool gases. Was it but a temporary cycle, from which it would sooner or later emerge, restoring to its wonted plethora of life-giving radiation, or would it continue to whirl through space, a dark star, carrying along with it an entourage of tomblike planets through all eternity?

John Hammond, fur-clad, masked against the searing winds, turned with a gesture of resignation to his companion, similarly attired. He was Peter Golas, the chemist chiefly responsible for the artificial production of rubber.

"Take a deep breath, Peter, and look around you," Hammond said. "It's your last chance."

Golas nodded. As far as the eye could pierce the perpetual gloom the Earth was a frozen, rigid mass. The cupping hills were ghostly gray in the darkness. Through some break the moment was windless and clear. A terrible silence pervaded the wastes. The furred men seemed tiny excrescences on an otherwise motionless expanse. Behind them loomed the great hemisphere that was to be their precarious refuge. The *Hammondite* plates were already sheathed with a thick crust of ice.

Their heads tilted back as if at some unspoken command. The wan red ball of the Sun was near the zenith. It was high noon. Its face seemed veiled behind the black clouds of despair. The Moon, half a firmament removed, was a barely perceptible shadow. But the stars danced and glittered against the blue-black immensities of space with mocking fires. The Sun, their brother, was dying, while they were flushed with youth and eternity.

Then, out of the wastes of the north,

a gale came down with furious force. Vast smoking clouds drove before the blast, and in the twinkling of an eye, the depthless heavens, the stars, the ludduster Sun, were obscured.

Hammond shivered. The biting cold pierced even the layers of fur. But it was more than a physical shiver that rippled uncontrollably over him. Was that an omen? Would he, or any of the thousand in Glacida, or any of their children's children, ever see the heavens again, ever breathe the pure untrammelled air of Earth?

With a gesture that had something of finality about it, he turned again to Golas. "Come!" he said.

Together they bent against the wind and went in through the great lock. The last gates, outlet to a world of darkness and unutterable cold, closed behind them with an irrevocable sound. Outside, the gale rose to incredible hurtings of solid air and splintered ice over a dead world.

### III.

IT TOOK a week for life to settle down into a measured routine. It took much, much longer, for the inhabitants of Glacida to become accustomed to their circumscribed environment. But such is the elasticity and environmental yieldings of the human mechanism that within a year it required an effort of the will to remember what life had been on a green Earth, open to the winds of heaven and to the sight of a boundless firmament.

It took about that period of time to prove that Hammond and his associates had planned carefully. Nothing went wrong. Food was abundant, though rationed; the air was breathable even if it smacked somewhat of its artificial origin; and life went on.

Each man and each woman had his and her exact duties in the economy of the organism. Some tended the crops;

some mined in the frozen bowels of the earth; others tended the machines or taught the new generation the accumulated wisdom of mankind; and the laboratories hummed with ceaseless research.

At first the radio was the cynosure of all their thoughts and emotions. What, while they were immured, snug and warm and comfortable in Glacida, was happening to the rest of the world?

In August of the year 1986 they were still in communication with certain areas where life held on precariously. The temperate zones were completely denuded of life. Northern United States and all of Europe down through Germany and the British Isles were under a vast glacier. The oceans had frozen solid as far south as Cape Cod.

All the despairing millions of humankind, who had been able to jam their way southward, had congregated in a seething mass along the equator, there to catch the last semblance of warmth that still exuded from an expiring Sun. The fetid jungles of Brazil, the arid sands of the Sahara, the steaming entanglements of lower India and Malaysia, were crowded with humanity.

There was not enough food; there was not enough room. Every man's hand was against his brother. The last days of the world resounded hideously with the screams of the slaughtered, the low tortured meanings of the dying. Disease and pestilence swept with flaming swords through the depleted ranks of a maddened people. Millions died of slow starvation; millions more succumbed to the all-embracing cold.

Daily, Hammond announced to the shuddering people of Glacida the melancholy news that another radio station had broken off in mid-speech, to join the eternal silence of its fellows. Valiant spirits who stuck to their posts to the last extremity, trying desperately to establish communication with their fellow unfortunates, succumbed one by one to

disease, cold, hunger, or the sudden irruption of marauding bands who had fallen lower than beasts.

Finally, the last station I took off on a sudden cry for help. The outside world was dead, a gigantic tomb. But there were still the radios of these communities which had banded like Glacida. There were some twenty of them in the world; some sheltering a thousand and some a bare five hundred. The wisest and best spirits of mankind had been incorporated in these places of refuge, and they were located wherever oil or gas, coal, iron, and essential minerals were to be found in requisite abundance. Only one was farther north than Glacida. This was the city of Dis in the foothills of Tennessee, not a hundred miles away. But as far as physical communication was concerned, it might have been established in a valley of the Moon.

Then came the glacier.

IT WAS late in September. For weeks the inhabitants of Glacida moved about their appointed tasks with a sort of desperate intentness. Every one strove to be bright and casual. By common consent the topic was elaborately avoided. Yet no one was deceived. Terrible anxiety clutched at every heart.

The dread of approaching mountains of ice lay like unbearable weights at the bottom of their thoughts. Would the *Hammondite* roofing, with its puny thickness, resist the unimaginably terrific pressure of billions of tons of solid ice? Would it crash inward like an eggshell, and in one overwhelming instant crush out the lives of the thousand within?

To their eternal credit be it noted that very few feared for their own personal safety; it was the breathless thought that the fate of the human race depended on that single arch of alloy above them. They had no illusions. If Glacida buckled, built as it was under the personal supervision of Hammond,

no other refuge had a chance of survival.

Daily they passed the peepholes at which Hammond and Golas sat grimly and pretended it was pure chance or other business that brought them there.

Hammond had made these peepholes cleverly. There were a half dozen of them, ranged at strategic points along the sides and overhead. Solid sections of the *Hammondite* sheathing swung on axes to seal automatically with heavily-lensed telescopes. Between eyepiece and object glass was a vacuum to avoid sudden changes of temperature and consequent frosting. A powerful beam light cast its rays through the tube and out into the outer world for miles.

To the north, where the hills were lower, they saw the first advance of the glacier. It was awe-inspiring; it was terrible in its majesty. Miles high, it seemed, going up and up into the faintly red-tinged blackness of the night. The white flare of the searchlights swung along the cold white surface to the east and to the west, and found no end. From Alabama to the northern pole it stretched, engulfing the world in a tightening cap of frigid silence.

On and on it came, inexorable, slow, flowing with the relentlessness of time itself. It piled against the beetling crags of a hill that was lordlier than the rest. It shuddered, reared like a grizzly about to strike, and heaved in unimaginable confusion. There was a great rending crash, like the concussion of all Earth's artillery firing at once, and the mountaintop, millions of tons of hard granite, sheared off as if it was a thing of papier-mâché, and went tumbling and hurtling along in the terrible waves of ice.

Within Glacida, even through the soundproof insulation, the terrific detonation lashed in a blast of sound. The roar was deafening; the structure trembled under the impact of the vibrations.

Golas groaned and averted his eyes

from the peephole. His face was ashen white. How could a paper thickness of metal withstand the march of the glacier when mountains were ground into powder? A man went through the thousand, like a wind in trees. Forgotten was their casualness, forgotten the transparent pretenses that brought them from their appointed tasks to huddle in a stricken mass in back of the two scientists.

But Hammond held his gaze to the telescope. He said nothing; his broad back was firm and immovable. He pressed a button at his side. The voice of the radio man, high in the central shaft, came through impersonally.

"Gar Wade calling."

"This is Hammond," the engineer snapped. "Try to get the city of Dis. See if they answer."

"Right, sir." The voice faded and the generators sent out their whining song.

Seconds passed, fraught with eternity for Hammond. If Dis did not respond, that meant—

The voice of Wade again, still impersonal, formal: "Wish to report contact with Dis. Engels standing by."

Hammond fought hard to keep the thrilling exultation out of his tone. He had not realized how keyed up he had been. Dis, one hundred miles north, in the path of the glacier, had survived.

"My congratulations to Dis," he said quietly. "Inquire how well they withstood the shock of the glacier."

More seconds, still meaningful, but not as tense as before.

Wade spoke through the receiver: "Engels wishes to report, sir, that he does not understand. The wall of the glacier is now about five miles to the northeast, swinging around the escarpment of Black Mountain. The city is in a dreadful panic. They are sure there is no hope."

Hammond sagged for a moment. He had forgotten about the great plateau

that shielded Dis to the north. The tremendous test was still to come. Then he stared along the beam of the telescope with a fierce pride in his handiwork. It *must* stand up.

THE firmament was blotted out. Nothing was left of Earth and sky but the upthrusting wall of ice. Tilt his beam as he might, he could not see the limits of that awful mass. Before its terrible advance was pushed the accumulated debris of plains and valleys and mountains. Uncounted millions of tons of rock and soil, grinding to powder under the pressure of the glacial giant, turning and roaring and heaving in a gigantic frozen wave.

Here and there the face of the monster was studded with embedded sections of rock, torn from the living bosom of the Earth, that Hammond incredulously estimated to be solid cubic miles of hardest gneiss and granite.

On and on it came, moving steadily forward, unbounding, unretarded by hills or valleys, sure of its might, certain of its prey. Five miles, four miles, three miles, two miles, a bare mile, closer, closer—

Wade's voice, no longer formal or impersonal, came excitedly through: "Engels is calling. He says the glacier is about to break over Dis. He says goodbye to Glacida—I can hardly hear him; there is a tremendous racket coming through—here he is! He says 'It's crashed; I—'" Wade's voice was almost a shriek now. "Mr. Hammond, Mr. Hammond! Engels cut off! I can't get him any more. The radio is dead. Dis has crashed!"

Too late the engineer, grim-faced, eyes burning, switched off the babbling operator. The sound of his hysterical voice had seared through the huddled multitude like a devouring flame.

But now he had no time to think of their reactions. The triumphant glacier made a solid sky-reaching wall not a

hundred yards away. The roar of its Earth-shaking progress thundered in his ears, made the puny hemispherical city toss like a cockleshell on the rushing tide. For a moment he stared in fascinated suspension at the mountainous masses that jutted like prehistoric bones from the all-engulfing ice.

Then he sprang away from the telescope and pulled frantically at a lever. One least touch of that mighty glacier against the peephole, and the last flimsy chance they had for survival would be swept away in incredible tons of ice.

The section swung on its axis, the telescope turned inward, and the solid *Hammondite* wedged into position.

The next instant the universe crashed on Glacida. Sun, Moon, planets, stars, nebulae, galaxies, roared with infinite concussions of sound into a single blazing, ruining mass. Hammond felt his eardrums pierced with sudden blasting pains; Glacida, with its lofting arch and central towers and prostrate dots that must be people, went whirling around and around like a pinwheel. Then the cold black waters closed over his head.

#### IV.

UNBEARABLE weights pressed down on Hammond, caved his skull in like an eggshell, made his ribs into splintering fragments of bone. Sharp agonies tore at his lungs, and all the waters of the world pounded in his ears. Then the waters ebbed, and he groaned.

He opened his eyes weakly, rolled his head to one side. The deathly silence was suddenly appalling. What had happened; where was he? Dim recollection filtered through his mind. Was he the only one alive, the sole survivor of a doomed city, buried under unfathomable stretches of ice?

He tried to rise. Swaying, every move was agony, he clawed his way erect. He looked around with fearful, bloodshot eyes.

Glacida was a shambles. Everything movable had been strewn over the ground. Delicate machinery had been wrecked. Motionless bodies, the bodies of the precious thousand, were deathly silent around him. Terror smote him. For the first time in his life he knew clutching fear. The fact that the shell of *Hammondite* was intact, that even now it was holding up frightful weights, never before measured by man, did not matter. His triumph was empty, hollow. Glacida was a tomb in which he was alone in an alien universe.

He cried out involuntarily, and the sound made mocking reverberations. Then he cried out again. For figures were stirring, here and there; feebly, it was true, but showing unmistakable life. Strength flowed into his racked body at the sight. He sobbed joyfully. He would not be alone. He ran on trembling legs for water, for stimulants, for dressings.

The damage was not as great as he had anticipated. Some fifteen only had died under the overwhelming shock. The rest recovered. For months they limped, or rested, while bones mended, and battered tissues regained their wonted resiliency. Machines had been wrecked, but none that could not be repaired or replaced. Fortunately, Hammond had prepared for all eventualities. The gas pockets had been sealed; all furnaces carefully drawn off fire. Some of the live stock had died, but enough remained for breeding purposes.

Despair gave way to optimism. They even joked about their predicament. Buried under five hundred feet, or miles, of glacier—they had no way as yet of telling—borne along on a frozen planet around a freezing Sun, these indomitable spirits—men and women both—tended their wounded, worked with furious energy to repair the damage, to make their little circumscribed world a good place in which to live.

The shattered radio was their first



thought. How had the others fared? Was Glacida the sole survivor of twenty cities?

It was a breathless occasion when Ter Enso, substituting for Wade, whose body reposed in an iron-frozen crypt underground, sent the first waves hurtling through the enveloping ice. It was an occasion for frantic cheers and delirious dancing when the first faint signal came through the province of San Luis Potosi in Mexico.

Pedro Ribera, eminent biologist, in charge of the city of Quexal, reported some half of his original colony of five hundred still alive, and the *Hammondite* skin intact. It was cause for even more delirious whoopings when Dis, thought destroyed, reported safety and a smashed radio as an explanation for the severing of communication. By the end of the year reports had been received from seven of the buried cities. There had been flaws in the *Hammondite*; fatal errors in construction.

Then, one day, some three months after, Borden, the astronomer, walked into the control room where Hammond and Golas were busy over a knotty problem in physical chemistry.

Hammond, looking up, saw the preternatural gravity of the elderly astronomer's countenance. He felt the shadow of disaster sweep through the room.

"What is it, Borden?" he asked very quietly.

The astronomer's hand trembled, but his voice was steady.

"Ever since this happened—I've been studying the reason for the Sun's inexplicable masking under cooling layers," he said.

Hammond nodded. He himself had suggested the research to Borden.

"I've found the answer."

Golas came to his feet. "What is it?" he demanded.

THE ASTRONOMER turned a haggard face toward them both. His

shoulders sagged wearily.

"There are two classes of stars that predominate in the universe," he explained. "Main-sequence, or red stars, and the white dwarfs. The reason for this has been evident since the beginning of the century. Main-sequence stars are those in which the atoms are still surrounded by their K-rings of electrons while the exterior rings have been stripped away by the tremendous heat. Their internal temperatures average about 32,000,000 degrees centigrade.

"Now let this internal temperature for any reason rise substantially, and atoms no longer exist as such. There are only free electrons and stripped nuclei. Given this condition, there is a quick acceleration of the process. The star has become unstable. It proceeds rapidly to the next stable state, which we call the white dwarf. The electrons and nuclei, no longer expanded into atoms, contract into a compacted mass. For a while the temperature of the interior is actually greater. But the outer photosphere, still in a state of equilibrium, and composed of complete atoms, is suspended, so to speak, in space, and cools off rapidly."

Golas wrinkled his forehead. "Very interesting." He nodded. "But what connection has this with our own Sun?"

"I'm coming to that," Borden answered. "Our Sun was a main-sequence star. But it lay dangerously close to the border line of stability, which, Redman long ago figured, ranged between the stellar absolute magnitudes 4.83 and 3.54. The Sun's magnitude was 4.85. You see how close it was to the region of instability. Once across, the last ring of K-electrons would be stripped away.

"A reduction in the Sun's radiation of three per cent would be sufficient to bring this about. That is exactly what has happened. The normal Sun-spot cycles, with their cooling effect, brought the Sun time and again terribly close to

the hair line. This time, with an abnormal number of spots, the hair line was overstepped.

"At once the Sun started its accelerating contraction." The more it contracted, the more the anontaly of increased interior temperature and outer cooling arose. The stripped atoms compacted more and more. Radiation, signifying light and heat, was compelled to struggle through more and more, compact and hindering masses of matter, and when it finally emerged, most of its energy had been absorbed. After a definite period, the photosphere will finally collapse, and the Sun will then reach its next stable state—that of a white dwarf."

Hammond said slowly: "And that means——"

"That the Sun will never again regain its original flow of radiation; that it will be a small, very heavy star like the binary companion of Sirius, and that all of the encircling planets, including Earth, are doomed to an eternity of death."

For a while there was a dreadful silence in the room. Before each man arose the same terrific picture. A dead world, ice incased, atmosphere a frozen solid, holding in its lifeless depths small scattered hemispheres of metal. Never to emerge into warmth and light and spaciousness, never to see the stars flaunting their banners in blue depths, never to hear the gracious purling of brooks, the pleasant rustle of wind through branches, never to see the clouds form and reform, and feel the bright warmth of a genial Sun on their cheeks—neither they nor their children nor their children's children.

To inhabit an eternal prison; to live and breed new prisoners and then die; to know that inevitably, though hundreds of years might elapse, their de-

scendants might gasp out their feeble lives in an airless, heatless tomb!

They shivered and looked sidewise at each other, reading the same terrible thought in each other's eyes. Better to destroy this hopeless city they had built in one swift merciful blow, than that they had envisioned.

SUDDENLY Hammond squared his shoulders, thrust his head back as though defying a malign fate itself.

"No!" he rasped harshly, answering the unspoken thoughts. "That is the way of cowards, of weaklings. In us flows the last heritage of man—that tender-fleshed, puny creature who, by sheer force of will in the face of hopeless odds, came up from the brute to be the conqueror of a hostile universe. Let it not be said by whatever gods there be, that now, in this last extremity, he succumbs without a struggle, without a vestige of his old proud defiance. We will keep on, we and our children's children, until we die. We shall go down in defeat, but it will be a defeat more glorious than any victory."

An electric wave seemed to surge through the room. In one great voice Golas and Borden cried:

"You are right, Hammond! Let us go on, fighting!"

And so, in a small chamber, hidden within a straining hemisphere of metal, buried forever under millions of tons of ice, attached irresistibly to a whirling, frozen orb, doomed to circle eternally around a small dim star through depthless space, three men, themselves infinitesimal bits of sluggish protoplasm, raised their voices in defiance of the universe itself, and by their very defiance, achieved the supreme heights to which the dead vast masses of matter that oppressed them could never aspire.

by Nat  
Schachner

# MIND OF



**T**HE VAST ROTUNDA of the Hall of Science was packed to suffocation. Tier on tier the scientists sat, thousands of them, representatives of every Tribe in the world, all faces converging in eager absorption on the speaker's platform at the bottom of the bowl. So tremendous was the

hall that the outermost benches would never have been able to distinguish the tiny doll-like figure whose hand was raised for silence had not the delegate of the Opticos thoughtfully provided them with highly efficient view-glasses.

Unfortunately some of the scientists, notably those from the Tribes devoted

# THE WORLD

Illustrated  
by  
Elliott Dold, Jr.



to subdivisions of the social sciences, could make neither head nor tail of these strange instruments, and inasmuch as the Opticon felt that he had been sufficiently benevolent in distributing an adequate supply, there were scattered delegates who left the hall under the impression that the Tropo-Chemists, in

the person of Warren Bascom, the chairman, were manikins rather than normal human beings, and therefore not worthy of serious consideration.

What happened was that these deluded scientists had reversed the view-glasses in bringing them to bear on the speaker, with truly surprising results.

The Tropo-Chemists had made a brave attempt to refurbish the faded splendors of the Hall of Science for the occasion, but the accumulated dust and grime of centuries could not be easily removed. The tremendous structure was a venerable antiquity, a monument to the third millennium when the people of the earth were still divided into nations based upon the accident of contiguous birth rather than upon community of interest in work and scientific labors.

Warren Bascom raised his hand again. A vast hush followed the buzz of the assembled scientists. He was tall and stooped and wrinkled. The snow of his fine silky hair testified to a goodly number of years, and the wide-spaced eyes and generous mouth to a certain benevolence of disposition that was unfortunately rare in the thirty-second century.

"Representatives of the Tribes of the World," he said, "the Tropo-Chemists bid you welcome to this first Inter-tribal Conference. The response to our invitation has been overwhelming and beyond all expectations. I admit it was with a good deal of hesitancy that I issued the call, in view of that last memorable meeting of the Association for the Advancement of Science in the twenty-eighth century, when certain scientists attempted to incorporate with their own experiments the hastily and illy digested reports of research in other specialized fields, with results that were disastrous and from which the world as a whole has only recently recovered.

"But," and he took a deep breath, "desperate times demand desperate measures. The very fact that you have decided to attend a general meeting shows that you are aware of our deficiencies."

The delegate of the Psychopaths leaned confidentially to his neighbor.

"That's true," he said. "My Tribe's been living from hand to mouth since

the last drought destroyed our crops. We'll starve if something isn't done. Otherwise I'd never have left the experiment I was conducting on the effect of switched neurone paths on hallucinations to walk five hundred weary miles to this conference."

His neighbor looked at him blankly. He was a Rocketeer. "Neurone paths?" he echoed with a puzzled air. "I don't know what the devil they are, but the fact that you walked here amazes me. Why, I came from a considerably farther distance—four thousand miles, to be exact—and made it in four and a half hours. Why any one should walk when there are rockets is beyond me."

The Psychopath said curiously: "I've heard of such machines, but there's no one in our Tribe who has the faintest idea of how they are made."

"Simple enough," the Rocketeer remarked with a certain degree of condescension. "But you are right about the general situation. Something has to be done. Our crops gave out, too. We've barely enough to keep us alive another month."

"Pardon me for interrupting," said the man on the left. He had been following their conversation with the closest attention. "Neurones and rockets mean nothing to me. Wouldn't know a neurone if I met one face to face. But your discussion as to failure of crops and possible starvation is almost inconceivable. This, gentlemen, is the thirty-second century, not the twentieth. Why depend on the whims of nature for your sustenance? We Food-Synthesists get ample nourishments from small pellets. Make them ourselves from very common elements."

The Psychopath and the Rocketeer turned to him eagerly. "Maybe you could teach me——" they began simultaneously.

The Food-Synthesist smiled a superior smile. "We've worked at the problem

for hundreds of years, and you think you could be taught in——"

"Sssh!" Angry whispers buzzed around him. "We can't hear a word with all that chatter. Keep quiet!"

The offending delegates subsided guiltily and tried to pick up the thread of Bascom's speech.

"AS EARLY as the twentieth century," the Tropo-Chemist was saying, "science had reached the first crude steps of specialization. No longer could any one say with that ancient philosopher, Bacon, that he had taken all knowledge to be his province. Scientific facts and scientific theory had branched out into such innumerable ramifications that it was impossible for any man to have a thorough knowledge of more than one particular science.

"Soon even that, with the sweeping progress of new discoveries and investigations, became a dream rather than a reality. No longer was one a physicist, an astronomer, a chemist—he became a mathematical physicist, an optician, a radio engineer, an atomist, a colloidal chemist, an electrochemist, an astrophysicist, a spectroscopist. The gulf widened and deepened. The fields became divided and subdivided, until a scientist spent his whole life in studying a certain small sector of knowledge. He went deep, to be sure, but he knew nothing, could know nothing, of the rest of the vast panorama of science, except such small allied fields as impinged directly upon his particular subject."

Young Allan Carey, of the Tribe of Vector-Analysts, wriggled in his seat. "That's not true!" he exploded in an angry whisper to his neighbor, Clyde Moorhouse. "There is at least one man in the world to-day who combines most brilliant special knowledge with that all-embracing knowledge of which the mythical ancient boasted."

Clyde Moorhouse smiled thoughtfully.

He was there in an anomalous capacity; in fact, as a species of superdelegate for all the numerous and varied Tribes among whom the study of mathematics was subdivided.

"I suppose you mean Kalen Thorn," he said innocently. "And I am inclined to agree with you. He is without doubt a great man. He dominates his Tribe, and Wave Mechanics is fundamental in the structure of the universe."

The young man exploded even more angrily: "That charlatan!" He glanced scornfully in the direction of the front row, where a dark, heavily built man was lounging with elaborate carelessness and a faint sneer on his thick, spuddled features. "I did not mean him. I meant you, Clyde Moorhouse, and no one else. Why, the very fact that the forty-odd Tribes of Mathematicians did the unprecedented thing in voting you as chief of all their delegates shows that."

Moorhouse blushed a bit at the immoderate worship in young Carey's eyes. He was a slight, unassuming man with hair just graying at the edges and a soft, mild voice.

"We had better listen to Bascom," he said hastily, "or we'll have nothing to report back."

"Gradually the old national distinctions were obliterated," Warren Bascom continued. "Research workers joined their fellows in the common fields of their endeavor, worked together, lived together, acted together. By so doing, they immeasurably added to the minutiae, the details of learning, in the subdivided subjects. The Tribes were formed; the children took up the work where the fathers had left off. Specialists bred specialists. The Tribes became a rigid caste system. They drew away from each other, tried to become self-sufficient.

"Coöperation, the old glory of science, no longer existed. In fact, with the increasing depth of specialization, it

became impossible. A lifetime was hardly sufficient to master the tremendous amount of data available in one's particular Tribe. The rest was a howling wilderness of ignorance."

Bascom smiled apologetically. "I am a Tropo-Chemist because my father and his father were Tropo-Chemists. It is a fascinating subject, I grant you. I know all there is at present to be known about the reactions that take place in living protoplasm when subjected to the influence of light. I know less about the influence of sound or electricity. Others in the Tribe have delved into those phases. I know nothing at all about neutrons for instance, or the historical evidences of geology, or the inner constitution of the sun, or what takes place in my mind when I think. We live precariously on green plant life only because we were compelled to cultivate chlorophyll-bearing plants for the furtherance of our studies."

The Rocketeer asked his neighbor, the Psychopath, curiously: "What is chlorophyll?"

"You've got me, brother," the Psychopath answered humorously. "I'm a stranger in these parts myself."

Clyde Moorhouse listened intently. No one in the vast audience, not even his young friend and worshiper, Allan Carey, knew that he was directly responsible for this conference. All the ideas that Bascom was propounding to the assembled delegates were his, the fruit of years of solitary observation of the strange complexities of the world, of silent delving into the past, and of certain secret conversations with his old friend, Bascom.

The Tropo-Chemist had protested: "Why don't you issue the call yourself, Clyde? It's your idea and you're entitled to all the credit."

But Moorhouse replied earnestly: "I'm too inoffensive a type for missionary work. I couldn't get it across. You could. You've got brains and energy

and a certain aggressiveness. Besides, if the plan was known to emanate from me, Kalen Thorn would automatically oppose. You know that."

BASCOM knew, and yielded the point. Thorn hated Moorhouse. The mathematician was the only man in the world whose reputation for all-around learning was greater than his. Publicly Thorn might sneer at the superior attainments of his rival, but privately, in the recesses of his own consciousness, he acknowledged their force and hated him all the more for being compelled to admit it.

The Tropo-Chemist lifted his voice. It rang through the great hall.

"It is a strange and a terrible thing to say," he declared, "but it is my belief that the very advances in science of which we are so proud have proved a great and overwhelming disaster to the world. In our very heights of knowledge we have grown abysmally ignorant. The earth was a far happier place and, yea, a more civilized and scientific place, in the twenty-fourth century when science was still a cooperative affair and not a matter of neat little watertight and mutually exclusive compartments. The wisdom of one was the wisdom of all; it was not hoarded, as now; it was squandered for the benefit of all mankind. Who shall say we are happier to-day? Who shall say we, as individuals, as members of disparate Tribes, possess half the good things of life, possess half the learning, attainments, or broadmindedness of a man, say, of the twentieth century, even?"

He paused and looked dramatically around. Yet inwardly he was frightened at his own temerity. He had used bold words, and the delegates might resent them. The Tribes were vain and touchy about their respective fields of research. To each, no matter how tiny a sector it might be, it represented the very pinnacle of human thought, and all other



Tribes and their particular problems were looked down upon as from an Olympian height.

A wind stirred through the delegates at the challenging assertion. It was an uneasy, half-angry restlessness. Men looked furtively at each other, seeking a lead. The smallest spark might touch them off, one way or another.

IT WAS the Psychopath who furnished the spark. He rose suddenly from his seat, high up on the terraced bowl.

"What Bascom has stated in such bald terms is the truth," he shouted passionately. "I am a Psychopath, a deliver into the twisted abnormal workings of the human mind. I was contented, immersed in my work. Just now, however, for the first time, I realize my deficiencies, the deficiencies of all of us. I heard to-day of achievements of which my Tribe has never been able to avail itself, of which, in fact, I had only the faintest knowledge.

"I walked five hundred miles to attend this conclave; my friend, the Rocketor, on my right, flew eight times that distance in a few hours. My Tribe is starving because our primitive method of farming is inadequate; the same is true of the Rocketors. Yet I understand from my left-hand neighbor, a Food-Synthesist, that his Tribe is independent of nature's vagaries; that they manufacture their food direct from the elements themselves.

"I see now what Bascom is driving at. We have been inordinately selfish; we have allowed science to master us, instead of our being its master. We must cooperate, as did a younger world. We must share our knowledge, so that the good fruits of our researches are available to all, so that I, too, may ride the upper regions of the air in rockets and be assured of a never-failing food supply."

He sat down, and delegate murmured

approvingly to delegate. There was scattered handclapping; soon it would grow to a torrent. Bascom's wrinkled face was further creased with smiles. The unknown's irruption was most opportune.

Carey turned eagerly to Moorhouse. "Splendid!" he whispered, all aglow. "Now is the time to spring that new invention of yours."

"Hush!" Moorhouse cautioned him. "Bascom knows what to do."

But another than Bascom rose to speak. The clapping died suddenly; all eyes turned to the heavy figure in the front row who faced the multitude.

"Kalen Thorn!"

The whisper ran like fire through stubble. There was a deathly silence. His name was known throughout the Tribes; the nature of his work in Wave Mechanics and a certain genius for publicity, quite rare in that day and age, had seen to that.

His black-browed features were imperious, compelling.

"I say it is all nonsense," he said coldly. "A delusion, a figment of the imagination. We have progressed far beyond such primitive arrangements. We cannot go backward, even if we wished. Only disaster would result from the half-baked attempts of any of us to comprehend and utilize the ardously acquired knowledge of the other Tribes. Remember what happened in the twenty-eighth century when a similar experiment was tried. It would be far worse to-day; in my Tribe alone the researches of that century are considered crude and fumbling. Who is there not of our Tribe who could possibly utilize what we have spent whole lifetimes in acquiring?"

A voice from the middle section came faint, but clear: "But you, Kalen Thorn, could apply your gigantic grasp of the Wave Mechanics to the problems of the others."

There was a ripple of applause. Delegate nudged delegate at the telling point.

Thorn bowed to the flattery. He was not displeased. But he said: "I haven't the time. All my poor life is devoted to my science, to the accumulated learning of my tribe."

Carey muttered some very disrespectful words to himself. Bascom felt it was time for him to intervene.

"Kalen Thorn is quite right," he said very courteously. "Unaided, it would be an impossible task for any man or even group of men to cope with the gigantic wealth of unrelated knowledge that the numerous Tribes possess. I would not have called you here in convention unless I had the answer. It is really very simple, or, rather, it is made simple by means of a marvelous invention that has been brought to my attention by one of you who for the present prefers to remain unknown."

There was a low buzz of excitement. Thorn looked blank.

"It has all been explained to me," Bascom continued, "and it sounds plausible, even though my special knowledge is not competent to cope with all its intricacies. But those of you in whose provinces they lie can check each of the underlying principles."

"Knowledge, thought, is a matter of certain physical and chemical activities in the neurones, or specialized cells of the brain, and their interlocking dendroes. Synapses, I believe, is the technical term for the paths of connection."

The Psychopath and the delegates of affiliated psychological subdivisions nodded vigorously.

"The physicochemical activity known as thought, however," Bascom continued, "gives rise to tiny electrical impulses. These impulses radiate in space on definite wave lengths as do all other forms of radiation. But they are infinitesimally short, and their radius of propagation limited. What our anonymous benefactor has done was to invent

tiny broadcasting units which could fit inconspicuously inside of light flexible helmets. These are clasped to the head.

"The broadcasting unit amplifies the radiations, steps them up in power, so they can be transmitted over sizable distances. Another unit, a receiving one this time, is installed in another helmet, which steps down the radiations to normal intensity. Special antennae, with the exact nature of which I am unfamiliar, cause the impulses to penetrate to the recipient's neurones and synapses, there to set up the same physicochemical reactions as in the brain of the broadcaster. In other words, the wearer of the receiving helmet achieves all of the knowledge and thought processes of the broadcaster without long years of study and tedious toil.

"By a judicious selection from each Tribe, there would soon grow up a body of men possessed of sufficiently broad and pertinent knowledge to permit a goodly portion of the experiments of each subdivision to be appropriated and coordinated for the benefit of all. Within a year, I would venture to say, the human race would achieve heights undreamed-of to-day."

He paused, a practiced orator, waiting for comment. Doubt and indecision overcame the delegates. Each step of the disclosed invention checked scientifically with the special knowledge of certain groups, but no one could envisage the whole. The great hall buzzed with low, excited conversation. Clyde Moorhouse sat unperturbed. Allan Carey wriggled with impatience.

"Think they'll agree?" he whispered.

"It's an experiment," Moorhouse answered quietly.

KALEN THORN scowled blackly. Inside he was a seething furnace. He alone grasped the thing entire, saw in a blinding flash its tremendous implications. Why hadn't he conceived this invention, utilized it for his own pur-

poses? Who the devil was this unknown genius? He must kill this thing boldly, publicly, before it ran away from him. Then, in the privacy of his laboratory, he would begin work.

He arose.

"A very pretty conceit," he said with just the right tinge of condescension. "Unfortunately, however, such an apparatus, even if theoretically possible, would be tremendously difficult to construct. I for one can see certain important obstacles. So it is quite necessary that we know the name of this—er—genius before we decide."

"That is just what I am forbidden to disclose," Bascom returned with some heat. "And only because the man is too modest, too self-sacrificing, to take the credit that is rightly his. I can vouch for his—as you said—genius. Yet what does it matter? The important thing is whether the apparatus works. He has already built the helmets and is willing to have them tested."

Thorn whirled on the rising murmur of approval, shouted it down with stentorian tones: "No one but a quack, a charlatan, would hide in anonymity. There may even be a sinister purpose behind all this. Who knows what effect the apparatus may have; who knows but it may do irreparable harm to the wearer? We must have the name of the inventor as evidence of good faith."

Thus he clamped, feeling assured that he could load down with innuendoes and contemptuously the reputation of any tribal member who avowed the invention of such an all-embracing unit. His mind was working darkly and swiftly.

The delegates looked aghast at each other. There was much in what Thorn had said. They had been on the verge of something hasty, of something—

Carey could stand it no longer. Breathing quickly, aware of his youth and inexperience, yet irresistibly impelled, he shouted:

"The name, if you must know, O Kalen Thorn, is Clyde Moorhouse!"

THE RISING tumult went down with dramatic suddenness. The Mathematician shrank in his seat, flushed, embarrassed. His plucking fingers had been a shade too late in grasping at young Carey's arm. Bascom murmured a silent prayer of thanksgiving. He blessed the hot-headedness of the Vector-Analyst.

Thorn scowled darkly. His thoughts raced on and on. He should have known that it could have been no one else. Already his practiced mind sensed the approval that was gathering strength in the great concourse of delegates. His face broke into a rare smile. He shifted his tactics.

"Moorhouse!" he exclaimed with a certain bluff heartiness. "That, of course, is different. I have the utmost faith in his disinterestedness and wide learning. The machine will work. Now the question is just how to apply it for the greatest possible good of humanity. Bascom, our chairman, has made a suggestion. It is fair, but it doesn't go far enough."

He looked winningly at Moorhouse. "I am sure my friend, the inventor, will agree with me that this plan is a mere makeshift."

Carey started from his seat angrily, but Moorhouse plucked him down.

"Let him talk. He is putting over the idea for us," he murmured.

"But don't you see he is trying to steal the credit from you?"

"What of it?" Moorhouse returned tranquilly.

Thorn appeared to be thinking deeply. His face lighted up. "Ah, I have it! The very plan! So simple I'm surprised the sponsors of the invention hadn't thought of it before. Why utilize hundreds of scientists, removing them from their necessary work, to pick up stray tags of knowledge here and there?

There would be too much confusion and duplication of effort. The result, while an improvement, would still be unsatisfactory.

"We want cooperation, do we not? We wish to have the entire fund of knowledge now sealed in millions of separate and alien minds utilized for the common good, brought to bear as a coordinated unit on the solution of any given problem. Very well, then.

"Select one scientist, a man already possessed of an agile, nimble brain, a man who has already proved himself by reputation and by deed. Give him the receiving helmet. Then build millions of broadcasting helmets, one in fact for every man and woman in the world. Let them wear these helmets simultaneously. Do you see what would happen?"

His voice rose to oratorical heights. It beat and thundered through the vast rotunda, deafening with its richness, stirring with its simulated enthusiasm. He thrust back his head and narrowed his eyes.

"A gigantic vision! All the accumulated wisdom of millenniums of mankind pouring in a waveless flood into one man's mind. Facts, hitherto seemingly unrelated, dovetailing like the pieces of a puzzle, conception rubbing against conception and emitting vital sparks, theory smoothing on theory to make order, unity, truth, where only chaos had reigned before.

"Think of it! What problem now troubling science, the world, would remain insoluble; to what supernal heights could not the human race attain? A single mind—the world's repository of knowledge, the common reservoir in which all scientists may dip and find the answers. He would no longer be a man, an individual; he would be a symbol, the common possession of the world. His life, his mind, would belong to all humanity."

His voice sank to a thrilling whisper, while the delegates harkened in fascina-

tion, a many-stopped organ on which he played with skillful fingers. Already had they forgotten, in the magic of his speech, the real inventor of the apparatus of which he disposed so cavalierly.

"It would be a sacrifice," he whispered, "a tremendous sacrifice. The chosen scientist must give up the privacy of his own mind, yield himself for the common good. Yet do I, Kalen Thorn, announce unhesitatingly that I would gladly——"

"It's a trick!" Carey yelled furiously.

He was on his feet, pushing his way forward. But it was too late.

The delegates had swallowed the bait. A thundering roar cut off what Thorn was going to say. It sped like a wave over the tiers and crashed in clipped syllables against the quartzite outer panels.

"Thorn! Kalen Thorn!"

Thorn held his hands outspread. "You have decided," he said. "It is not for me to refuse."

The great council broke up in a torrent of hoarsely shouting, perspiring men, eddying in hero worship around Thorn, who had offered himself for the supreme sacrifice.

Clyde Moorhouse still remained in his seat, ashen-faced, staring thoughtfully into blankness. Only two men were at his side; no one else remarked his presence.

Warren Bascom said in strained tones. "Good Heaven, Clyde! If I had known—it was your job; you should have let me——"

Moorhouse said wearily: "I would have refused. I had thought of this single-repository idea myself, and it made me very much afraid. It is efficient, yes; but I trembled at the temptation of such vast power in the hands of one man. I couldn't trust myself, even."

"It would have been all right with you!" cried Carey. "But Thorn!" He turned almost fiercely on Moorhouse.

"You must refuse to manufacture the apparatus; you must not let him have it."

The gray-tinged scientist shook his head. "The council has decided, and I must obey its commands. Kalen Thorn is a great scientist; we may have misunderstood him. His speech really moved me."

"Speeches!" Allan Carey muttered, and was perforce compelled to accept the older man's decision.

## II.

THREE MONTHS later the great experiment was about to be concluded. Kalen Thorn had made his headquarters in the great Hall of Science in the territory of the Tropo-Chemists. It required infinite labor on the part of Moorhouse to assemble sufficient materials for the manufacture of his helmets from the hitherto self-sufficient and disparate Tribes. But with Bascom and Carey as assistants he managed at last, set up factories, and turned out the slender broadcasting helmets by the millions.

They were beautiful bits of workmanship. Silvery gray, flexible and form-fitting, composed of the new rubber-beryllium alloy, they weighed only a fraction of a pound. Cupped over each ear were the broadcasting units which caught the electrical impulses from the thought-processes of the brain and sent them hurtling through space.

The receiving helmet, of which only one was constructed, was a magnificent thing. It sparkled with golden iridescence and the crest held in a hollow compartment the tiny vacuum tubes and resistance coils which stepped down the impinging waves to the infinitesimally tiny vibrations that would activate the neurones to conceptions and ideas exactly similar to those of the sender.

Kalen Thorn was a revelation to the three suspicious friends. He conducted himself modestly and discreetly; he

made graceful little speeches lauding the genius of his good friend and confrère, Clyde Moorhouse; he listened with eager humbleness to all suggestions.

"There, you see," Moorhouse told the others, "we have misjudged the man."

Bascom agreed with him, but Carey only snorted and worked on with a certain savage intentness.

At last the great day came. The helmets had been completed; each tribal delegate had sped back with his Tribe's full complement to his own territory.

The Hall of Science seemed bare and dismal, though there were almost two hundred present.

Kalen Thorn, seated on the dais, looked somehow startling and magnificent in his glittering helmet; like Mars in the full panoply of war, or Jove in Olympian council grasping a thunderbolt. On either side of him stood Clyde Moorhouse and Allan Carey, both bare-headed. Carey was stollen while Moorhouse was thoughtful.

In front of them, filling the first tier of seats in a compact knot, sat the Tribe of Tropo-Chemists, with Bascom. The broadcasting helmets rested lightly on their heads. Their faces were at once serious and excited. It was obvious that they were concentrating their minds on exalted problems, on rapid resumés of all their knowledge, so as to assist the process.

A single button rested under the Mathematician's finger. From it wires spread, disappeared in sheaths under the ebony platform. There was a breathless pause. Moorhouse hesitated, took a last swift glance at the inscrutably dark features of Thorn, breathed deeply, and pressed the button.

The signal flashed to every Tribe in the world, assembled in its own conclave. Helmets were adjusted and the scientists, men and women of the world, leaned back fearfully, enthusiastically, or with blank indifference, according to their temperaments. Though instruc-

tions had been detailed and careful, most of them were disappointed. For the helmets produced no sensation whatever. In fact, they were exceedingly comfortable.

A Historicon said with some surprise to his wife, similarly adorned: "Why, these contraptions could easily be worn all the time without any trouble."

KALEN THORN gripped the arms of his chair. For a moment he was filled with alarm. Would the helmets really work? Would they accomplish everything their inventor claimed for them? He was of two minds. If they failed, his rival, the man he hated, would be forever discredited before the world. It was a tempting thought. He rolled it secretly around his tongue; then resolutely discarded it.

The helmets must work.

He watched Moorhouse press the button that would determine their fate. It fascinated him, that slight pressure of the forefinger. Then he had no time for visual observations.

His brain seemed to warm, to expand, to flow gratefully atop a widening river of coruscating, sparkling sensations. His eyes widened. Problems that had puzzled him for years suddenly floated to the surface, pellucid, orderly in their neat solution, so simple he was surprised he had not stumbled on the answers long before this.

New knowledge seeped into his brain by imperceptible stages. The stars in their course—in one flashing vision he penetrated their innermost secrets, saw the flaming atoms at work. Unrelated facts and ideas, hitherto locked separately in innumerable minds, clicked into place, made a pattern that explained for the first time the seeming paradox of matter which partook both of the nature of waves and of discrete particles. He wanted to shout out his discovery to the world—and locked his lips.

He, who had neither known nor cared

for the history of the planet he inhabited, saw the Neanderthal man painfully rising from the brute; saw the Cro-Magnon artist put the last loving touches to the red-ochered aurochs on the cave wall; thrilled to the building of Solomon's temple; followed Alexander in his magnificent march through the Asiatic borders; surged with the swelling verse of Shakespeare's "Hamlet," sole extant play of that mythical genius; heard the toy guns thudding in the first World War; shivered to the mightier crashes of the second war; entered the last Council of the Scientists to follow the hasty gobbling of knowledge and the half-baked experiments that burned whole sections of the globe with ineradicable atomic fires and traced the inevitable splitting into Tribes.

Chemistry yielded its secrets; so did biology. The secret of the creation of life leaped full-born into his brain; the facts were all there, but no one had encompassed them for the final delicate step. He pigeonholed that idea in one corner of his steadily swelling mind. Physics in all its phases was an open book, and geology, and anthropology.

He floated on and on in the ever-widening stream of impouring minds; he felt godlike, supernal. He saw things in flashes of omniscience—fewer and fewer were the problems he could not solve.

He was the brain of humanity, the reservoir of the race, the communal aspiration of its soul.

The little audience was surprised at the subtle changes in Thorn's countenance, the illumination that spread over it like a flame.

"Why, he's like a god," some one murmured in awe.

Thorn felt other influences. Not only the wisdom of the people flowed into his brain, but also their innermost thoughts, their desires, their secret hopes. The minds of all mankind were open books to him. No one had anticipated this; not Thorn, not Moorhouse

himself. If Moorhouse had, he would deliberately have destroyed his invention. Yet it was severely logical. The helmets were unthinking mechanisms and made no fine distinctions between electrical impulses emanating from diverse thought processes.

Thorn smiled—people were to call his smile godlike—and said nothing.

For increase of intellectual power brought no appreciable difference in his moral nature. It only added sharpened weapons for the furtherance of the things he had always subconsciously dreamed of doing.

He turned to Moorhouse. The scientist, slight, unassuming, gray around the temples, looked insignificant in the presence of the gold-helmeted Thorn.

"The experiment is an unqualified success," he said. "My mind teems with the wisdom of all mankind. Consider me a storehouse, a library of knowledge from which the scientists of the world may draw what they may need. I am no longer Kalen Thorn; I am the collective intelligence of the race."

Thus Thorn, canny as ever. He remarked with inward fury the fact that Moorhouse had not worn a helmet. Carey's refusal did not matter very much, though he resented the sullen suspicious stare of the young man. But there were certain mathematical problems in his mind clamoring for solution, problems that required the finishing touch which only the brilliant solitary researches of Moorhouse could add. Yet he dissembled under a gracious exterior. The time was not ripe.

"I trust you will use your wisdom in accordance with your professions," Moorhouse said meaningly.

In spite of Thorn's seeming acquiescence, he was afflicted with a strange uneasiness. It was that feeling which had made him doff his helmet just before the test. Carey had been frankly rebellious.

SIX MONTHS had passed since Thorn had become the collective intelligence of the race; months of tremendous activity, of broadening of the boundaries of human thought. Thorn seemed everything he had proclaimed himself to be.

From his quarters in the Hall of Science, clad night and day in the golden helmet, he organized and planned. Tremendous energy infused him; his orders crumbled out in an unending stream.

One of the first of these was that every one should wear his helmet, even as he did, night and day. He explained by saying that until the world was fully organized on its new basis he needed every bit of their separate ideas. It sounded reasonable. Besides, as has been noted, the helmets were quite comfortable.

Then he sat and pondered, and issued more orders. Rockets were developed to greater speeds and range of flight and made available to all the Tribes. Food, in the form of synthetic pellets of complete nourishment and varied palatable flavors, put an end to back-breaking farming and dependence on nature. Disease became an anachronism, except for arteriosclerosis, cancer, and a few rare and obscure ailments. On these there was not sufficient data for him to coordinate. He mapped out lines of attack and set all the Tribes of Medicine and Biology to work.

For Thorn still adhered to the divisions into Tribes. It made for greater thoroughness in research, he explained, though Carey grumbled that it was because he wished no one else to pull out of the narrow rut of ideas.

Within three months the world blossomed into an earthly paradise. Food, communications, disease, entertainment, climatic control, luxuries, all were ordered in such wise that the name of Kalen Thorn became deified in the popular consciousness. Men and women



traveled in the new swift rockets from the remotest places of the earth to pay their homage, and were received with becoming graciousness and modesty within the Hall of Science.

Moorhouse smiled quizzically at his young friend, Carey. "Now you see," he reproved, "how limited our understanding of the human mind really is. I admit at first I was somewhat infected with your skepticism, but it would have been impossible to find a better man in whom to have submerged the collective intelligence of the race than Kalen Thorn. He has surpassed all my expectations.

Allan Carey raged inwardly. He could not answer Moorhouse's arguments. They were logically unanswerable. There was not the tiniest flaw to be found in Thorn's magnificent structure of the world. Yet suspicion lingered; all the more searing because he laid himself open to ridicule by admitting it. If only Moorhouse—true genius that he was—had not been so ridiculously supine; had seized the chance for himself.

Yet he could not resist one little stab.

"Wasn't it a little strange, though," he mused as if to himself, "that your plans and all the materials for the manufacture of the golden helmet should have been destroyed by fire within a week after Thorn's assumption of the collective intelligence?"

Moorhouse started. "Nonsense!" he said half angrily. "It was during a thunderstorm. Lightning struck the factory and burned it down. It would have happened in any circumstances."

Carey probed relentlessly. "I suppose," he said quietly, "that is why you and I have inserted the microscopic breaker in our helmets' broadcasting units."

Moorhouse looked shamefaced. Though Thorn had elaborately avoided the issue, it had become increasingly embarrassing for them to appear in public

without the helmets. Others looked at them askance. There were mutterings, too, about self-centered men, unwilling to merge in the greater good of humanity. The fact that Clyde Moorhouse was the original inventor was by now completely forgotten.

These scandal-mutterings had been deftly instigated by Thorn.

At last they were compelled to don the helmets. But as Carey's insistence and in accordance with Moorhouse's own secret feelings, the Mathematician installed a contact-breaker, so small that it was not visible except under high magnification, yet so sensitive that it made contact only when the will of the wearer concentrated on the transmission of thoughts. Thus Thorn received only such thoughts and thought-pictures as they wished him to receive.

At first he was highly exultant. Certain mediocre mathematical formulas filtered through Clyde's mind; nothing that Thorn did not know already. Could it be that the famous Moorhouse, whom he had always secretly envied, was merely a charlatan, a pretender to knowledge he had never possessed? It was a warm and thrilling feeling, even though the problems he had postulated on what Moorhouse knew could not now be solved.

Then slowly suspicion came to him. There was something wrong. Whereas the life of every one else was an open book for him to read, concentrate as hard as he would, no hint of the personal thoughts of the scientist came through. What, for instance, he really thought of Thorn; of the fact that he had practically stolen his invention and the ensuing credit and power. There were gray hiatuses that could not be penetrated. And the same held good for the young puppy, Allan Carey. It was passing strange.

Thorn concentrated on them while they were in his presence, but all he found were certain stereotyped ideas



The tube controls were balanced so delicately that at some points even a foreign touch would play havoc.

and bright thoughts that were manifestly artificial. Their real minds were as blank as their faces. He examined their helmets, under friendly pretense, and found nothing amiss.

Thorn was puzzled; more, he was angry. A most ungodlike fury seised him. But he restrained himself. In another month when his plans were matured—He smiled grimly. Moorhouse would be kept alive, unless it was true that his mind had nothing to offer, and Carey would die.

AT THE END of six months, however, the cloven hoof began to peep surreptitiously from under the pure white garments of sanctity. Thorn had consolidated his position; more, he was becoming autointoxicated with his own supreme power.

He rose to infinite heights, from which he looked down at the tiny, average mortals toiling and grubbing on the earth with contempt. They were insignificant, wormlike creatures while he was—yes, a god! At first he said it guiltily, defiantly, to himself, then he grew assured and proclaimed it to the world in mystic, hieratic phrases.

He forgot that he was the collective intelligence of the race; that all his wisdom and knowledge was merely the result of a certain golden helmet—the invention of another—which brought to him the reappings and gleanings of every man, woman, and child in the world. He fancied himself now as the source of all wisdom, and humanity as lesser creatures basking in the effulgence of his godlike powers.

From affability and gracious availability to all and sundry, he withdrew himself now into the august shadows. A golden shrine was built within the Hall of Science; armed men, fantastically dressed, guarded him night and day; visitors could penetrate into the holy of holies only after much genuflection, and even then the presence was

only a voice. He was too sacred for human eyes; he was definitely on the way to becoming a god.

It was true that the earth still bloomed and prospered. Science made gigantic progress—each new fact discovered by a toiling specialist in a Tribe immediately was tabulated in Thorn's mind in juxtaposition to a hundred related facts disclosed simultaneously by other specialists; each vivid and novel theory that sprang to fruition in any corner of the world at once rubbed shoulders with a theory evolved at the opposite end of the earth. New inventions for increasing the comfort of the human race, for minimizing labor, came in an unending flow.

But there were drawbacks. Thorn was activated not by any abstract love of humanity, but by an insatiable lust for power. The people had everything, that is, along material lines, but they were slaves, whether they knew it or not. By imperceptible stages their lives were regimented and arranged for them, their waking and sleeping hours, their work, their very pleasures.

An efficient army of mercenaries, loyal only to Thorn, quietly sprang into being. They patrolled the air lines in swift rocket cruisers; they mingled arrogantly with the Tribes. There were mutterings among the older, more liberty-loving, members of the Tribes. They had been accustomed to fierce individualism, and now they were being herded. The sight of armed men with power of life and death and bearing the diamond insignia of a single man irked them.

They began to question privately, to long for the cruder, less scientific, but freer air of the self-sufficient Tribes. From inner doubts they proceeded to murmurings in secret among friends. Nothing stirred on the outside, but underneath was discontent that might lead to sudden explosion.

Thorn, seated godlike in his shrine,

received the impact of these rebellious thoughts. When the time was ripe, he swooped with the speed and ruthlessness of a hawk. All over the world, in the dead of night, his soldiers penetrated the homes of bewildered, frightened families and arrested the ones whose thoughts had betrayed them. Thousands disappeared that night and were never heard of again.

The humble science, the storehouse of the world's collective wisdom, was gone; in his place was a dictator, a tyrant, to whom the people whose genius he abstracted were subject slaves.

Some there were to whom a glimmering came. They removed their helmets secretly, in spite of orders. But Thorn was prepared for that. He made removal of or tinkering with the apparatus punishable by death, and his mercenaries were given powers of summary execution.

Furthermore, he devised a recording machine which, when attached to his helmet, checked each individual wave length on a tabulator. Every man, woman, and child received two numbers—the first, the generic number of the Tribe; the second an individual one. Thus he could tell when any helmet was not transmitting properly.

It must not be assumed, however, that the vast mass of the people was discontented with the increasing tyranny of his rule. Quite the contrary. Most were sufficiently bovine in temperament to welcome the complete submergence of their wills and responsibilities to one central force. They were fed, clothed, and well taken care of physically and even mentally—the fact that the small spark of spiritual freedom was absent did not bother them in the least. The rebels had already been slaughtered.

Moorhouse watched all this with increasingly pain-stricken eyes. He saw his invention, intended for the common benefit of all mankind, utilized to enslave and destroy. In that mild-man-

nered, unassuming man glowed a vital spark, of which even Allan Carey, his worshiper, was unaware. In the Scientist and Mathematician was the stuff of which martyrs were made, once his eminently equable mind had weighed all possibilities and decided on a course of action.

Carey was in a perpetual stew. He, too, had seen the inevitable trend of events. He urged on Moorhouse the necessity of immediate action; of the physical danger to themselves if they delayed.

"You don't think," he said, "that Thorn will rest quietly while you are alive. He realizes that you are a perpetual threat to his continuance in power; that even with the intelligence of all the world to back him up, you have an individual reservoir of your own that surpasses his."

Moorhouse smiled. "Your friendship blinds you," he said mildly. Then he frowned. "I'm still waiting and hoping that Thorn will swerve from this new course of his; that it is only a passing phase."

### III.

THE FOLLOWING night the visor-signal buzzed in the Mathematician's room. He clicked it open.

The figure of Kalen Thorn, golden-helmeted, seated in a great golden chair, filled the white screen. Cold inscrutable power emanated from his still-muddled features.

"Clyde Moorhouse," he said without preliminaries, "you are to report to my presence at once, you and your companion, Allan Carey." He glanced meaningfully at the silvered helmet that Moorhouse always wore. "I intend to see once and for all just what there is about your helmet that conceals your thoughts from me; or whether in truth you have only the mediocre mind you disclose."

The eyes of the Mathematician flashed



dangerously, but his voice was calm and even. "And if I refuse to report?" he asked quietly.

Thorn's lips curled into a thin smile. "My soldiers will call for you within an hour if you do not appear."

Moorhouse said patiently: "Of course you realize that you have no right to authority or to an army of private mercenaries. Your function is merely that of a clearing house for the human mind, the servant of humanity. I am a free member of a free Tribe—the Tensor-Mathematicos. We do not accept orders."

Thorn smiled mirthlessly. "Don't be a fool, Moorhouse. You have evidently been living in a world of illusion. I'm afraid you never had the genius your reputation proclaimed for you. Remember, within an hour, my men will call for you, and their methods of persuasion are not too pleasant."

His mocking laughter still floated off the screen as his features faded.

For five minutes of precious time Moorhouse stood motionless, his eyes blank on the vacant screen. In those five minutes the destiny of the world was being rearranged.

At the end of that period of silent contemplation, the Mathematician sprang into action. Gone forever was his mildness, his inconspicuousness. His eyes blazed with strange lights; behind them the powerful dynamo of his brain sparked and crackled with energy; his manner was sharp, his speech incisive.

He knifed the switch to Carey. That young man appeared on the screen.

"Hello, Moorhouse!" he greeted.

"I want you here in five minutes," Clyde snapped.

"What's the matter?"

"Ask no questions. We're going on a visit. Remember—five minutes!"

He snapped off the screen abruptly, leaving a very much bewildered youngster at the other end. If the wave was tapped, as no doubt it was, Thorn would

believe that he had been frightened into obedience.

Allan Carey arrived with twenty seconds to spare. He was breathless. He had never heard Clyde Moorhouse in such a short mood before. He was even more surprised in his physical presence.

"For Heaven's sake, what's the matter?" he gasped.

For answer the scientist leaned over, ripped the silvery helmet—the badge of slavery—off Allan's head. Then, almost in the same motion, he ripped off his own and flung them both violently into a corner.

Allan stared at him incredulously; then, with dawning comprehension, came another gasp.

"You—instead—fighting now," he whispered, almost awed.

"Yes. It came before I was really prepared, but Thorn forced the issue. Within an hour we are supposed to be dead men."

Characteristically Carey overlooked the personal danger. He was staring at his companion with new eyes.

"You mean," he asked, "that all along you had been intending to do something?"

"Of course! A blind man could see what Thorn was developing into. I did not dare tell even you of my plans, for fear of a leak. The preparations are not complete; there are vital factors missing. I needed another month. But Thorn must have sensed something, or felt himself powerful enough now to obliterate us. So we must act."

Allan thought of all his angry exasperations with this strangely transformed little man with the gray-tinged hair, and swore: "Well, I'll be damned!" Enthusiasm flooded him. "We'll sweep Thorn off the face of the earth in no time."

Moorhouse shook his head soberly. "Don't fool yourself. We are up against an almost insuperable task. We

are fighting, not one man's mind, but the collective intelligence of a billion brains. We are fighting, not one man's brawn, but the physical strength of a billion bodies. The people are slaves, yet they do not realize it; they are content. To them we shall be traitors, destroyers of their ordered world, anathema."

Carey grinned confidently. "I'll stack your brain against the rest of the world any day," he said. "And as for strength—" He flexed his muscles with limbe, animal grace.

"Food delusions!" murmured Moorhouse, pleased in spite of himself. "But time is getting short. We have much to do before the soldiers arrive."

"WHERE are we going?" Allan asked, as they walked rapidly through the warm, glowing night. It was mid-winter, but Thorn had found a way of relaying tropical winds to the farthest reaches of the earth so as to maintain perpetual spring and summer. Also, by ionization of the air molecules, a phosphorescent glow had been imparted which illuminated night into a paler softer day.

"To Warren Bascom."

Allan stopped. "But he will betray us; he wears the helmet. He doesn't know anything—"

"Of course not! I didn't dare tell him. But Bascom is a friend of mine and loyal to his ideals."

They were not announced. Moorhouse knew of a back entrance to the quarantine establishment. They went in silently, trod the moving escalator to the sleep-floor, stood before the couch on which Bascom had flung himself in sleep.

Clyde Moorhouse studied his friend a moment. There were many more fine lines in his seamed face than there had been six months before; his mouth was drawn and tired, and his hair thinner and whiter. The silvery helmet hugged

even his dream thoughts with its closeness.

Moorhouse bent down, caught the sleeping man's head with both hands, and jerked. The helmet slid off and went sailing across the room. Bascom cried out, awoke with fear-stricken eyes.

"It's all right, old friend," Moorhouse soothed him. "I had to be rough and quick. Otherwise your thoughts might have betrayed us to Thorn."

Bascom sprang from the bed. "What's up?"

Clyde explained rapidly. "I was sure I could count on you to help. You remember I hinted a long time ago that you guard your thoughts carefully."

Warren Bascom's face went bitter. "It was a terrible strain," he said feelingly. "Seeing Thorn rise to be a god—forsooth—and keeping my thoughts and emotions as blank as possible. But now, whether I live or die is not of much importance. At least I shall have struck a blow for liberty."

"Good! Now get into your clothes. We have only fifteen minutes to spare."

In three minutes they were on their way again, avoiding the pacing guards who haunted the park areas of the great city. Also they avoided as they would the plague the fast-moving ribbon conveyors that hurtled passengers across the countryside at graded speeds of twenty to two hundred miles an hour. They used their own legs and went along deserted footpaths.

At the end of the allotted time they were seated in a small rocket plane. It had been cached in a cleverly concealed hollow in a deserted valley. As they went upward into the night with soft roarings, mercenaries of Kalen Thorn broke into Clyde Moorhouse's private quarters.

FOR A WHILE nothing was said. Moorhouse piloted the rocket with sure touch. They were up in the stratosphere, thirty miles high, above the usual traffic

lanes and patrol ships, making better than a thousand miles an hour.

By now they knew the alarm was out for them, and earth and sea and air were being combed in a gigantic man hunt. Yet Carey smiled comfortably; he felt an abounding confidence in his friend. If only he could see Thorn's face for an instant when he heard that his prey had escaped him!

An hour and a half's flight, and Moorhouse broke the silence.

"We're dropping here."

The two others stared down through the golden night at the sullen-forested terrain below. Desolate mountain ranges swept away as far as the eye could see; to the extreme east stretched a surging sea.

"Where are we?" Bascom asked.

"Labrador!"

The pair looked at each other, wondering. But Moorhouse vouchsafed no further information. The rocket was dropping with breath-taking velocity, straight for a cleft in the hills. When it seemed almost as if they would crash, flame and sound thundered out from the forward jets, and, cradled in blasting, retarding gases, the ship eased gently into the gash, down to a smooth terrain and alongside a rough log cabin of an older day.

"Headquarters!" Moorhouse said with new-found brevity.

They stretched cramped limbs and entered. A maze of machinery greeted them—complicated coils and condensers and tubes and dynamos. All scaled down, almost to toy proportions. Yet bulky enough to leave bare room for three bunks flush against the wall.

Carey and Bascom looked at their friend in bewilderment. He smiled.

"I've been up here almost every night for the past four months, transporting supplies in the rocket ship, working until just before dawn. Then back to my own place to catch a few hours' sleep."

"Have you been able to duplicate the

receiving helmet?" Bascom asked eagerly.

The Mathematician's features clouded. "No," he admitted. "In the first place, my calculations were destroyed—by fire, Thorn said—and it would take years to retrace the formulas; in the second place there were certain elements in the tubes that require the use of *stellite*, and the only mine in the world of that rare material is in the territory of the Lepidopterists. I made discreet inquiries recently. The mine has been excavated at a furious rate and every ounce of material transported to an unknown destination."

Bascom's heart sank. He had been counting on his friend's ability to duplicate the receiving helmet; to fight Thorn's omniscience with equal omniscience. Now that hope was lost, and, with it, fresh evidence of Thorn's resourcefulness and ruthless plans.

One man against a world of men, embodied in a single individual. Bascom had no illusions. His own specialized knowledge in Light-tropic Chemistry meant very little in the ensuing titanic conflict. Carey's youthful vigor was an asset of course, though little enough in all conscience. The complex of instruments and machines meant nothing to him; he could not recognize a single one. They seemed pitiful toys. All then depended on the slight shoulders of one man, a genius, true, but still only a man.

Yet his voice was gay as he said: "Good! You won't be confused then by a lot of conflicting ideas and dailards' concepts."

Carey said with a joyous grimace: "Bring on your world."

But Moorhouse was not fooled by the old man's pitiful attempt at encouragement.

"If I had another month's grace," he began, when a voice crashed in among them with the startling suddenness of a clap of thunder.



It came from nowhere and from everywhere. The hut was filled with its resonance. It was the voice of Kalen Thorn.

"Clyde Moorhouse!" it boomed. "By your guilty flight you have confessed yourself a traitor, a hatcher of foul conspiracies against common humanity. I knew of your plot to wreck the world in a mad attempt to seize all power, but in the goodness of my heart I hoped to show you the error of your ways."

"Now you have fled to consummate your despicable plans—you and your co-conspirators, Allan Carey and Warren Bascom. I, Kalen Thorn, the all-seeing, the omniscient, despise your puny efforts. I shall crush you like an insect underfoot. Even now you are under my constant supervision, under my very eye. Surrender yourself at once, or I shall not yield to further leniency."

THE VOICE ceased, and silence reigned in the hut more appalling than any sound. Carey had sprung to his feet at the first syllable, eyes swift around the room for hidden men, body tensed for action. Bascom was suddenly bowed down by the weight of years. His eyes were wide with inner agony. Only Moorhouse listened to the end without movement, calmly, inscrutably.

"There's a loud speaker somewhere around," Allan cried, feverishly thrusting into the maze of instruments. "Thorn discovered your hide-out, installed the unit before we got here."

"You won't find a speaker," Clyde replied, "and you'll only damage my apparatus."

As Carey emerged a bit sheepishly, Clyde continued: "Nor does Thorn know of this place. If he had, he wouldn't have wasted time on silly threatening speeches; he would have had men placed here to arrest us on landing."

It was so obvious that it left them only the more confused.

"Then how in Heaven's name—" Bascom began helplessly.

"The collective intelligence of a whole world is nothing to underestimate," Moorhouse returned gravely. "This is only a foretaste of what we are up against. I am somewhat in the dark as to the exact details of this broadcast voice, which, without doubt, has been duplicated all over the earth wherever such conditions exist as we have here."

"And those are?"

"The presence of vacuum tubes. He knew that my flight was not aimless or merely erratic; that I had been prepared against the day. And there are few instruments in a nonspecialized scientific laboratory that do not depend in part on the use of vacuum tubes."

"But the tubes were cold, without any current," Carey expostulated.

"Tubes that have been used are never completely de-activated. There is an electrical lag. In other words, the moving electrons which make up the current continue to flow for long periods after the power is shut off, though at a reduced rate and in minute quantities. Thorn evidently discovered this principle and availed himself of it. A super-penetrating wave would derive as much power from the feeble electron flow as ordinary broadcasting waves do from currents of normal intensity."

"And the reproduction of the voice without a sounding unit?"

"That," declared Clyde, "is the most inexplicable of all."

He stared hard at an innocent-seeming vacuum tube inconspicuously set in a machine. He reached for it suddenly, plucked it out of its socket.

"Just as I thought," he announced with a shade of relief. "Look at the bulb."

They did and saw nothing unusual. Moorhouse tapped it with his finger. It gave out a clear, bell-like note. He tapped it farther up on the bulge. The tone deepened.

"Sono-glass," he said. "The new composition evolved by the Quartz-Molders under Thorn's direction. Its peculiar crystalline form permits it to vibrate along internal planes without distorting the rigidity of the whole. Thorn made the change-over to tubes of sono-glass in anticipation of some such emergency as this, and without my having realized it."

Bascom was frightened; he trembled in every limb. How could they fight against such supernal intelligence? They were doomed. Yet he resolved to die rather than show the terror that ate at his vitals.

"All right," said Moorhouse. "We'll swallow a few pellets first—I'm hungry—and then we'll get to work. There's a certain piece of apparatus that must be completed."

#### IV.

ALL THAT NIGHT and all the following day they worked under Clyde Moorhouse's whiplash energy. Neither of his assistants knew exactly what it was they were doing, but Moorhouse radiated confidence, and they were content.

Twice a certain delicate instrument sent its pointer quivering over a dial. At once all work stopped and every machine idled to a halt, every source of current was promptly shut off. Holding their breaths almost, they watched the telltale pointer until it slowly sank back to quiescence. A sigh of relief, and work, indefatigable, furious, went on and on.

"No use taking chances," said Moorhouse. "I am giving Thorn credit for knowing at least as much as I do. This detector gives warning of every possible type of vibration within a radius of one hundred miles. Light waves, sound waves in the atmosphere, electrical disturbances, all react on its sensitive cells. Just now there was a focus of vibration moving through a point

some forty miles southwest of here and three miles up—a rocket ship. Thorn is searching for us. No doubt he has equipped his cruisers with instruments similar to mine. That is why we had to quit until it was gone."

Late at night the apparatus was completed. Moorhouse stepped back to survey it with food, understanding eyes. The others looked wearily blank.

"Well," Carry asked doubtfully, "now that we have it, what is it?"

It was strange enough in all conscience. A series of short thick steel bars made a complete circle parallel to the floor. Each bar was attached by wires to a dynamo. In the center of the charmed ring towered a huge quartz tube. It in turn was attached by radiating spokes to an uninterrupted circular tube running parallel to and within the series of steel bars. From this at spaced intervals rose more tubes which twined together in a dome effect over the huge central quartz.

Bascom gaped at this until his eyes hurt. Never had he or any other mortal seen such intricate, insane curves and convolutions as the knot into which the tubes were twisted at the top. They seemed alive, snake-like, in their writhings. He could have sworn that they moved in a shimmering dance too rapid for him to follow.

But the most grotesque nightmare of all was the sight of a single quartz jet which emerged from the shining confusion, sharp and clear for eight inches, to blur suddenly into a haze and taper off into nothingness, dangling, so to speak, in mid-air.

"This," said Moorhouse without exultation, "is the weapon by which I mean to blast Kalen Thorn into nothingness."

Silence greeted him.

He smiled. "I don't blame you for polite disbelief. But it is so. And Thorn, I am positive, knowing nothing of its fundamental principle, will be unable to defend himself against it."

"Not," he added apologetically, "that I wish to boast. But it involves tensors of a nature that I alone have investigated. No one else in the world even knows of their existence."

"But what does it do?" Carey asked with just a tinge of impatience.

"I'm coming to that. Up to a certain point it is the usual machine for building up high voltages. The current flares through the central quartz reservoir, issues through the radiating spokes into the outer circular tube. There it goes round and round, receiving tremendous kicks from the parallel magnets which are magnetized in progressive series. Thus the voltage is eventually stepped up to a hundred million volts. So far there is nothing that is not familiar to specialist Tribes. Now, however, comes the novelty.

"The tremendous voltage is led into the interlocked array of domed tubes. They are barely visible; they seem to blur on your vision. There is a reason for that. They trace a series of curves of the fourth order, curves that conform to tensor formulas which make them undulatory. The crowning achievement of all is that final tube which blurs off into nothingness. That, my friends, is the last tensor, an equation of strain worked into matter which penetrates the fourth dimension, the space-time continuum. Put your hand over it."

Bascom waved his hand tentatively a foot above the invisible end and recoiled with a cry. "There's an invisible wall!" he gasped.

"Exactly! The fourth-dimensional boundary, harder than the hardest beryllium steel, impenetrable except by means of that one equation."

Carey was awed but practical. "Interesting," he said, "but what—"

"Wait a moment! In the space-time continuum our three-dimensional planes lie side by side. I've calculated the respective positions of our base and the Hall of Science where Thorn holds

forth in godlike seclusion. The nozzle of the tube is so directed as to be not more than a dozen linear feet from the throne he has built."

Carey took a deep breath. "I see," he said slowly. "You will generate a bolt of lightning powered with a hundred million volts, shoot it through the fourth dimension directly into his chamber and blast him out of existence."

A shadow passed over Clyde's features. "Heaven help me for taking human life, but—"

"It means the salvation of all mankind," Bascom put in with energy.

"The Tribes will not thank us. They are happy and contented as it is."

"Future generations will see our act with clearer sight."

"Perhaps!" Moorhouse sighed. Then once more he was alert, dynamic. "Tomorrow morning, at eight, we act. Thorn invariably enters his inner chamber by then."

ALLAN CAREY tossed all night. He could not sleep. He listened to the deep steady breathing of the older men and envied them their calm. The fate of the world depended on the next few hours, and they snored. As for him he was too excited. He listened to the murmuring of waters outside, the wind rushing through the trees, the far-distant roar of the ocean.

Moorhouse had evidently staked all on this one blasting venture. If it did not work, if Thorn escaped its hurtling impact, they were as dead men. Thorn, with the mighty combined intelligence of a world behind him, would ferret them out, destroy them ruthlessly.

He awoke to find Clyde Moorhouse shaking his shoulder, and the dawn sun slanting over his bunk.

"Wake up, sluggard!" The Mathematician smiled. "It's almost time."

Muttering incoherent apologies, Allan sprang into his clothes, sloshed his face with water to clear his addled brain,



gulped a few food pellets. Bascom was already stationed at the dynamo, watching the time signal.

One minute to eight.

Lahrador and the Hall of Science were on the same meridian, hence there would be no difference in time.

Allan jumped to the magnetic switches. That was his job. Clyde took care of the tube controls.

Eight o'clock! Zero hour!

"Dynamos!" Moorhouse said in a low, tense voice.

Warren Bascom knifed the switches. The machines whirled into sparking life. The current sluiced into the central tube, flared with blue leaping flame in the vacuum. It sprayed through the spoked tubes into the outer circle, made a complete circumference of sheeted light. The dynamos hummed with gathering power.

"Magnets!"

Allan made contact. Electricity surged into the short steel bars, one after the other, in rapid progression. Mighty fields of magnetic force picked up the swirling current, kicked it along with boosts of energy. Faster and faster the magnetic fields alternated; faster and faster sped the current in the circular tube. The blue flame became a racing, pulseless vortex of energy.

Each magnetic field, flashing on and off, stepped up the voltage, each revolution made the speed of the streaming electrons even more inconceivable.

Moorhouse watched the special voltmeter like a hawk. A by-pass through measured resistance coils gave voltage of measurable figures. Multiplication by a fixed factor gave the true result.

One hundred million volts hurtled through confining tubes—man-made lightning of irresistible power.

With a queer reluctant gesture Clyde opened the perpendicular sluice. The leaping electricity roared into the complex of tensor-curved tubes overhead. An instant's dazzling sheeting of flame,

then the open dangling tube lighted up with a brilliant blue. There was a rending crackling sound, and the tremendous bolt of electricity vanished abruptly into nothingness, into the space-time continuum of the fourth dimension.

"I hope——" started Bascom.

That was all. What it was he had hoped, no one ever knew. There was no chance even for a cry of warning. Light impulses traveled no faster than the disaster that overtook them.

A split second only had intervened since the missile of destruction had sped on its way. Split second of fate! Back from the fourth dimension, retracing its path with treacherous fury, came the gigantic lightning bolt.

Roaring out of nothingness, it slammed into the dangling tube, sped with frightful velocity through tensor tubes and strange dimensional curves, back into the circular sluice and into the maw of the central quartz. The walls could not contain its shattering impact.

There was a spouting column of flame, a gigantic rending noise, and the universe collapsed in blinding heaving light on the three scientists in the laboratory.

ALLAN CAREY moaned and opened his eyes. Unbearable weights tried to keep them closed. Every nerve ending in his system shrieked with agony. He lifted his hand slowly, felt his head. Sticky fluid came away with it—blood.

For a moment he lay on his back, looking stupidly at the open sky, the blazing sun. The peculiar odor of burning beryllium rubber affronted his nostrils. They twitched, and with the reflex came comprehension.

The death-dealing missile aimed at Thorn, the immediate revenge, that last monstrous flare-up. How was it he had not died? Where were——

A weak groan answered him, a querulous, pain-stricken voice:

"For Heaven's sake, Carey, don't lie

there forever! Take this magnet off my leg."

Allan tottered joyfully to his feet, heedless of aching limbs. Bascom lay close by, pinned under one of the heavy bar magnets, his seamed face blackened and twisted, his white hair smeared with blood and grime.

One heave of powerful shoulders and Bascom sat up, gasping.

"I'm all right," he managed to say. "Where's Clyde?"

"Here, my friend!"

A cheerful voice seemed to come out of the ground at their feet. The Mathematician crawled from under a section of smoking roof. An open gash sliced his forehead, and he limped.

The crippled trio looked at the charred and twisted ruins. Smoke still gushed from smoldering embers. Not a single piece of apparatus remained in recognizable, much less usable, shape.

Three helpless, hopeless men, deprived of all aids, wounded, stranded in the Labrador wilds, in the middle of pathless mountains and forests, hunted outlaws with a world against them!

Warren Bascom said with quiet bitterness: "We might as well die right now. It will be swifter and more painless than at Thorn's hands."

Carey squared his shoulders, shook his fist in futile defiance at an unknowing south. "Damn you, Kalen Thorn!" he shouted. "You've won the first trick. It took a billion minds to do it; you couldn't have done it alone. But wait—wait——" He trailed off sheepishly. "The apparatus didn't work," he finished fully.

Moorhouse stared at the wreck of his hopes with bright, sharp eyes. "But it did," he said.

Warren Bascom started eagerly. "Then Thorn is dead?"

"Unfortunately no! He couldn't duplicate the feat, but he did something else, quite as effective. He has anticipated an effort on our part to hit di-

rectly at him and built up a defense wall of perfect resilience and elasticity. Just what the nature of this wall is, I don't know. It might be a new material hitherto unknown to science, or it might be an interlocking skein of vibrations.

"In any event, with ideal elasticity, Newton's first law operated with classic efficiency. To every action there is an equal and opposite reaction. The resilient wall caught the lightning bolt as it emerged from the continuum and rebounded it along the path it had just traced with equal speed and energy. It wrecked our laboratory, just as Thorn had intended it should."

Bascom cried out suddenly: "A rocket ship, heading this way!"

Startled eyes followed his rigid finger. Far to the south, silhouetted against the morning sun, was a tiny speck. It grew momentarily on the sight; it was coming along fast.

"Into the woods!" Allan yelled and started to run.

"Come back!" Moorhouse called. "We have our own rocket."

Carey had forgotten about it. They reached it with furious pounding feet, slammed the air locks behind them.

A blue streak left the side of the oncoming cruiser, came sizzling through the miles of distance, and crashed into the ground not ten feet from their quivering hull. Rocks, trees, and earth fused into fiery liquid and evaporated in a blast of heat. Thorn had discovered atomic disintegration and had harnessed it as a lethal weapon. The next shot would catch them square.

"Hold tight!" the Mathematician yelled.

He jerked the levers of the rocket tubes wide open. There was no time for normal acceleration. Flame spouted from the banked tubes with continuous roars. The rocket shuddered and leaped straight up into the air. Bascom was thrown violently against the side, Carey into the controls. Moorhouse wrenched

his arm in a grim death grip on the steering apparatus.

AT FIVE MILES Clyde straightened out its violent gyrations, sent it hurtling due north. The pursuit cruiser, heavily armed, could not keep pace. Within ten minutes it was helplessly behind. Within twenty they were over the eternal ice packs of the Northern seas. And still Clyde held the plane to its furious pace.

"What now?" asked Bascom with a shrug. "Every rocket cruiser in the world will be on our trail. We're bound to be caught."

The voice of Kalen Thorn resounded in the slender confines of the hull. This time they were not astonished; there were vacuum tubes in the broadcasting unit.

"I am glad you did not perish in the explosion, Clyde Moorhouse." There was a new sardonic quality to the voice. "It is sport to frustrate your puny plans. It is a relaxation from arduous duties. I am following every move you make. You cannot escape. The vibrations of your rockets are caught on the new sensitometer I have just constructed and give me directional bearings. You are now over the ice pack, ten degrees northeast of Baffin Bay. If you shut off your rockets you crash; if you land, you will freeze to death.

"I have arranged a novel experiment to test your powers of ingenuity. The air deflectors in the vicinity of the arctic circle will create a polar area of glacial cold and bitter storms. We shall see how long you can survive. A cordon of rocket cruisers armed with atomic disintegrators lies just outside the proscribed area to prevent your escape. You are to be confined to the circle of cold, until life has fled your stiffening bodies. Know that a supernal intelligence is diverting itself with you."

The voice of Thorn faded out on a chuckling note.

"Let's make a dash south," said Carey grimly, clenching his hands. "At least we can die fighting."

But Moorhouse held the nose of the rocket northward. His eyes were bright with thought. He said nothing.

Bascom wrenched at his arm. "Have you gone mad, Clyde?" he shrieked. "It's our last chance, and you're wasting time. Don't you believe that Thorn can do what he said; do you think he was just boasting?"

Moorhouse held the controls on their steady course. He did not even turn his head. A little smile quirked at the corners of his lips.

"I know that Kalen Thorn was not bragging," he replied. "I know that he can and will do what he threatened. He will deflect the warm currents he has relayed from the equator into the upper regions of the arctic atmosphere. The cold blasts, originating over the wastes of ice around the pole, will sink into the semivacuum beneath.

"The temperature will drop to eighty or more below zero. But that is not all. The vast influx of winds will create tremendous storms; the joinder in upper air of spatial cold and warm tropic breezes will precipitate their weighted load of moisture, and the arctic circle will be enshrouded in a perpetual blizzard of hail and snow."

Allan stared at him aghast. "Yet in spite of the terrible picture you have just painted, you are deliberately heading into disaster, instead of taking the one chance we have to the south."

"It is because I want Kalen Thorn to go through with his program that I am heading north," Clyde replied softly. "He traces our path by the vibration of our rockets and is content. I would not have him otherwise. For with all his magnificent control of nature, for all his collective wisdom, I believe he is digging his own grave."

Carey relaxed with a grin. He still had overwhelming faith in his friend.

But Bascom looked worried. The small seeds of doubt had been sown in him. The ridiculous ease with which Thorn had circumvented and rebounded, almost to their own destruction, the fourth-dimensional trap that Moorhouse had set had left him shaky. The man was in truth a god.

## V.

ON AND ON they went. The drifting icebergs, the open slashes of water, were gone now. The world beneath was a solid blinding sheet of ice. A white immensity in which no living thing stirred, as desolate and cruel as outer space itself.

At the north pole, Moorhouse cut the rockets and glided to a bumpy halt over uneven hummocks of ice. The same dead waste surrounded them here as elsewhere; there was nothing to show that they had reached the top of the world.

Bascom looked out through the glassine panels at a fast-lowering sky and shrugged futile shoulders. It was too late now to protest.

High overhead, in the upper reaches of the stratosphere, swirled the heated air from the tropics. The sun misted over with frozen vapor, thrust its last rebellious rays toward the earth, and expired in a bloody haze.

A pall of dense frost overlaid the world. From the frozen reaches of the stratosphere, ice particles, sleet and hail, fell with gravitational acceleration.

Then, far off on the limitless horizon, a dark, funnel-shaped cloud appeared. Even as they watched, it grew with seven-league strides into a twisting, murky shroud that enveloped ice field and sky in Stygian darkness.

It descended on them in a solid wall of wind that sent the rocket, wedged as it was between hummocks of ice, careening over on its side. The roar and the fury of the hurricane were inde-

scribable; the world was a lashing, pelting, crashing hail of ice and snow. Every strut and girder in the vessel swayed and groaned under the terrific impact. No storm created by natural forces ever equaled in power and vehemence this man-made cyclone.

The temperature dropped to one hundred below. Outside, it was impossible for any life to exist; inside, the chilling cold of space crept into their bones. The lights dimmed. A terrific clap of thunder shouted defiance above the hurrying roar; lightning blasted with jagged glare through the inch-thick ice on the glassine panels.

Buffeted, bruised, barely able to make themselves heard by yells above the elemental noise, stiffened with cold, they hung desperately to the straps and swings of the rocket. Every time a new blast twisted and flung the ship violently against the confining ice, the beryllium plates grated ominously. One tiny leak, and they were doomed.

Bascom was old—he knew it now. He was fast approaching the limits of his strength. Poor Clyde Moorhouse—adversity had addled his brain. He could not pit his single brain against the centralized mind of Thorn. In any event it would soon be over.

A particularly heavy gust struck them with express speed, almost turned them on end. Moorhouse staggered and would have fallen. Young Carry sprang to his support, shouted something in his ear. But the lash of the wind, the grinding noise of ice against the hull, made speech impossible.

Moorhouse, holding onto his strap with difficulty, was nevertheless placid of countenance. He looked at his time signal. Within one hour the storm would approach its climax. Hasty calculations, based upon observable air currents, had told him that. It was time now to act. Not even the stanchly constructed rocket could withstand the added buffetings. Yet the crux of his



careful plan depended on maximum elemental differences. It was a desperate, dangerous undertaking, yet the chances of ultimate success were—well—

He set his teeth, nodded to Carey, and snapped a switch directly over his head. As if by magic the smashing tumult of the cyclone-blizzard ceased. A deathly silence reared like a palpable wall within the cabin. Only the shuddering pitches of the ship showed that the storm still raged.

Bascom righted himself, shouted as if he still had to make himself heard above the gale: "What did you do?"

"I switched on the silence unit. Sends a wave of electrical impulses through the steel of the ship to dampen the sound waves beating against it. Now I can talk to Kalen Thorn without screaming."

Bascom groaned wearily. It was all too much for him. But Carey had little dancing lights in his eyes. He was beginning to see darkly as in a glass the strategy of the man and to marvel at his genius.

Moorhouse plugged in a wave length on his transmitter. It buzzed steadily for a minute. The ship pitched at more and more insane angles. Then a signal light glowed.

"Who calls the presence?"

A cold, arrogant voice, immensely sure of itself. The rocket ship was not equipped with a visor-screen.

"I, Clyde Moorhouse," the Mathematician answered in quiet, conversational tones.

"Ah!" A subtle change came over the disembodied voice. "Willing to beg for mercy, eh?"

"Not at all," Clyde replied sharply. "On the contrary, to give you warning. Your storm is a masterpiece; I grant you that. It is impossible to remain within the zone of its influence, so we are coming out."

"To surrender?"

"You would like that!" Moorhouse laughed. "We intend breaking through

your cordon. Nor can you stop us, neither you nor all your rocket cruisers. This time you have met your match."

The voice splattered, went incoherent with fury: "Why—you—swollen—"

Clyde went on inexorably: "More, to show with what contempt we treat your alleged powers, I shall even tell you where our plane will emerge from the arctic gales. Mark it down; memorize it. Our path is the sixtieth meridian. Within an hour we shall leave the arctic circle."

There was a choking roar, which cut off abruptly as Moorhouse removed the plug.

BASCOM'S eyes shone with admiration. "A very pretty comedy," he observed. "While Thorn concentrates his forces on the sixtieth meridian in answer to your challenge, we'll slip out in the opposite direction."

Clyde surveyed him quizzically. "On the contrary," he said; "we're proceeding at once to the very point I described. I am a man of honor."

Bascom was taken aback, but only for a moment. He rallied gamely. "I see. You expect Thorn to disbelieve you and scatter his forces all along the circle."

"Thorn will know exactly where we're going by the vibration of our rocket tubes," Carey pointed out. The young man turned to the Mathematician.

"It's a bit hazy to me, your scheme; but it depends, does it not, upon luring Kalen Thorn into taking personal charge of the defense?"

"Exactly! On that we live or die. That is why I taunted him, to goad him on."

"If I know Thorn, he'll react in the proper way," Carey said confidently. "He is probably choking now with fury at the thought that we, three puny mortals, dare defy his godlike powers. He'll forget all ordinary caution in that overmastering mania."

Clyde Moorhouse glanced at his time

signal, darted for the silencer, and snapped it off. He needed every ounce of power for the gigantic task ahead.

The storm beat around their stunned ears with redoubled fury. It was hard to believe that the plane could survive the gale. But Clyde, calmly confident, jockeyed it out of its perilous position with little bursts, and gave her wide-open throttle as it went bumping and careening over the frozen sea. Heavily and with much strainings the ship lifted into the teeth of the hurricane, her rocket tubes lashing out with flaming gases at a solid screaming wall of glacial wind and pelting ice.

At times it seemed as if they would turn completely over, or crash disastrously back to earth, but Clyde kept her nose steadily aloft, until the altimeter showed six miles and a drizzle of warm steam made impenetrable fog. Up there the winds were strong but steady.

"Here, take the controls, Allan. I've got to prepare my apparatus."

Without a word Carey took over, and they zoomed steadily south, while Moorhouse busied himself with certain mysterious duties. Only the softened gale outside broke the silence. Bascom wondered, but held his peace.

Within twenty minutes they would approach the appointed rendezvous. Already the mist and clattering sleet were thickening, even at that high altitude. The gale rose in fury, emulating the smashing chaos of the lower atmosphere to the north. Bascom strained forward, peering in vain through the black whirling masses that surrounded them.

Two hundred miles to the south was the limit of the arctic circle, the dead line that Thorn had established for the diverted winds from the equator. There, he knew, chaos must have reached its highest, most cataclysmic, flight. The powerful wind deflectors, smoothly pulsing, forced the warm winds upward, held

the cold blasts within the swift-moving circle.

At the line of junction there were almost inconceivable conditions—the wall of glacial cold meeting in terrific struggle the beating wall of warmth; titanic gales, comparable in fury to the whirling photosphere of the sun itself; overwhelming oceans of rain and frozen steam to which the interior forces would be but gentle zephyrs; through this no rocket, no vessel made by man, could survive. And even if, by some miracle, Carey could pilot them through, the rocket cruisers of Thorn lay massed outside, safe in the warmth and golden twilight of Thorn's genius, waiting with deadly disintegrators.

Moorhouse grunted and rose from his task. It was hard to keep balance; they were pitching frightfully.

He fastened a last wire, and a little filament glowed. Outside, suddenly, the darkness fell away. An orange flare penetrated the driving ice for miles, illuminated the jagged crystals with iridescent color.

"Are you mad?" Bascom demanded incredulously. "You're making us a perfect target for Thorn's cruisers."

Clyde rubbed his hands almost jovially. "I hope they see us" he said. "There are enough infra-red waves in the light to pierce the storm wall ahead." Then he sobered. "It's a rather desperate plan I've evolved. The chances of our winning through are pretty slim. But if Thorn is outside, he'll go with us in the general smash, and the world will be rid of slavery forever. It is only just that I risk my life, inasmuch as I am really responsible for what has happened, but you two——"

"Never mind us," Carey interrupted, looking back from the controls, "if you think Thorn can be eliminated."

"This is my plan," Moorhouse said. He watched the distance magnet. Another hundred miles to victory—or death. Thorn has arranged for us a

certain set of conditions. Two walls of air, one deadly cold, the other heated with the sun, in close juxtaposition. A difference of one hundred and seventy degrees in temperature, and a tremendous difference in barometric pressure. Ideal electrical potentials.

"Furthermore—and no doubt forgotten on his part—the atmosphere is ionized, for the praiseworthy purpose of creating a phosphorescent similitude of day out of the darkest night. But here we have everything for the production of lightning—heavily charged air; heavy drops in potential."

CAREY abandoned the controls in his excitement. He saw it now in all its perfect simplicity. But Moorhouse waved him back as the craft keeled.

"The stage is set," he continued, "for lightning on a scale never before witnessed or known since the earlier semi-molten days of the planet. Thousands of square miles of surface ready for a spark to set it off.

"That spark we must furnish."

Bascom braced himself. "You mean," he said, very low, "we plunge into the maelstrom and use our electrical power as a catalyst? Very well; I am ready."

Moorhouse smiled affectionately. "That way would be certain death, with the probability that our power is not strong enough to set the vast natural forces in motion. I told you there was a chance of our winning through. I do not intend entering the zone of conflict. That is why I made ourselves into a target. I want Thorn's ships to sight us through the cloud masses, to train their atomic disintegrators on us.

"They have power, more power than is necessary for our needs. The disintegration of the atmosphere into negative electrons and positive protons will form the sluice through which the vast electrical forces will crash from high to low potential.

"Thorn will create his own disaster."

A long silence while Bascom's mind reeled under the impact of the mighty plan, its simple daring, its sublimity.

Fifty miles more.

Thorn's voice swirled in the cabin. It came through the vacuum tubes; the transmission units were closed.

"You are insane, Moorhouse," he said exultantly. "Your rocket is already under visual observation. I, the presence, am in command of my cruisers. Prepare to die!"

On the heels of the voice, a tube of sizzling flame seared through sleet and howling storm as if they were fat droplets in an electron furnace. It missed the ship by a bare six feet.

Clyde's voice rose even more exultantly than Thorn's. "The collective intelligence of the race is only a man, with all of man's passions. Vanity and hate have led him into the trap. All right, Allan; you know what to do."

The young man grinned and swung on the controls. Paralleled to the arctic circle he fled, within the cataclysmic area, ducking, dodging, twisting with furious changes of pace, always within range of the outlying fleet, covering as wide a range as possible in his swift gyrations.

It was a grim game with death. The terrific bolts of disintegration screamed by them on all sides, ripping air and ice and snow into seeming nothingness. Inches separated them from eternity; a shaft sheered off a rocket tube, made control of flight more difficult. Allan, lips grim and white, swung again. The rocket responded lamely. They were lashed in a whistling, screaming, flaming furnace, the slightest direct touch of which was destruction.

"They'll get us now," Carey said tonelessly and swung again.

Moorhouse kept his eyes glued to the glassine panels. Was it imagination that made the storm swirl to the south lighten a bit?

No; there it was again. The faintest glow through black angry masses.

"Head north," he screamed, "for our lives!"

## VI.

THE ROCKET wheeled clumsily to the power of straining muscles, jerked northward. Another rocket tube blasted into oblivion. The next instant the whole of the south seemed to explode. A great ripping, tearing sheet of flame, so dazzling blue it blinded the observers, split open both heaven and earth. It pulsed out into space itself; it swarmed overhead in a huge cataclysmic arch; it leaped after the fleeing rocket with sheeted ferocity; it caught the puny vessel in a shroud of fire and whirled it forward at inconceivable velocity.

No sound of the enveloping catastrophe ever reached its victims. The lightning bolt left the concomitant thunder crashes far behind. But the rest of the world, as far south as the equator, heard and saw. The nearer Tribes, hundreds of miles distant, saw the northern sky flame into a consuming pyre of light, and, minutes later, heard the overwhelming concussion of sound.

Quartzite dwellings flattened like houses of cards, seismic waves through a trembling earth made chasms where mountains had been. A huge cloud of smoke covered the arctic zone with thick, impenetrable layers. From outer space the staid, unchanging earth seemed momentarily like a nova, a flaming re-birth.

Days later, when the first Tribal contingents ventured cautiously to approach the area of catastrophe, the edge of the still-smoldering cloud, they found the fused fragments of a thousand rocket ships—the massed forces of the presence, Kalen Thorn. Of Kalen Thorn himself they found no sign, nor did they expect to in the indistinguishable mixture of metal and charred bones and shreds of flesh.



*The supreme ruler!*



Kalen Thorn was dead—the mighty intelligence of mankind was immobilized in a cataclysm of his own making. The first day the people mourned and continued to wear their helmets. But on the second day came thought. Thorn was then not the god he had pretended—he was fallible; he was mortal. Nor were his mercenaries now in evidence. Most of them had died in that gigantic funeral pyre. The survivors who had been in permanent garrison took council and prudently effaced themselves. They had not been overpopular, and too many men might remember their swaggerings and arrogance.

Accordingly, when a Tribal member thoughtlessly broke one of the many fixed and unyielding laws Thorn had set for their guidance, and awaited certain punishment with trembling limbs, nothing happened.

It dawned then that they were free; that once more they could act and do as they pleased. The load for the most part had been unnoted, unfelt, but now that it was removed, it seemed as if unbearable pressure had been lifted. Like the swift destroying lightning that had ushered in their freedom from the north, the heady wine of revolt ran through all the earth. Tribe after Tribe in session repudiated the laws, hunted out and exterminated the cowering mercenaries. Helmets were torn off and burned with formal ceremony; and loud hosannas.

Individualism, as strong and unreasoning as had been their former subjection, held them in close grip. The pendulum had swung.

And still the heavy quiescent cloud of smoke enveloped the arctic and its secrets.

Moorhouse and his friends were not dead. By some strange freak of nature the lightning blast hurled them hundreds of miles to the north, back to the frozen ice packs of the pole, tossed them into a hundred-foot drift of blizzard snow and

buried them deep beneath the surface. Then the sheeted blaze flashed emptily out into space.

The three men were unconscious, of course. Human flesh and blood could not have been expected to withstand such terrific impacts without giving way. They were wrenched, twisted, bruised, skinned, toasted, burned—but alive.

Strangely enough it was Warren Bascom, the feeblest of the three, who awoke in utter darkness and, with much agony of soul and body, fumbled around until he found the others and restored them to some measure of life. It was Moorhouse, however, who managed to repair fused wires and burned-out bulbs and restored light to them.

Then they tended their hurts for a whole day and a night—as far as they could judge from the eternal darkness outside and from the irreparable ruin of all time signals. They also ate the scanty remains of their pellets, opened a port cautiously to scoop in drifted snow for drinking, and closed it hurriedly again.

They felt physically better now, but the future was dark, dark as the drift in which they were immured.

THE ROCKET would never move again, at least not without extensive repairs for which they had no tools. One hundred feet of snow smothered them under as in a grave. It was impossible to burrow through. And even if they reached the upper surface, a thousand miles of ice and icier water intervened before civilization could be reached. That is, if civilization was still extant. There was no means of knowing how extensive the cataclysm had been.

They stared at each other in the already dimming light with the faces of those about to die.

Clyde Moorhouse said steadily: "No matter! We have accomplished what we set out to do. Future generations will

be grateful to us for this day's work. Kalen Thorn is dead."

Allan Carey grinned wryly. There was no fear in his clear eyes. "That is at least as certain as the fact that we also are as good as dead."

"Much less certain, young man, than the second half of your thesis."

Allan whirled around; so did the others. The metal door of the air lock slid open, and Kalen Thorn entered, holding a Dongan unit in his hand. Behind him crowded two mercenaries, similarly armed. His head was bare and his face immobile. But his eyes glinted with little lights.

"Thorn!" Bascom gasped unbelievably. "But how did you escape—"

"The lightning blast?" Thorn smiled mirthlessly. "I am immune from destruction; my supreme intelligence foresees all contingencies and checkmates them with ease."

"You did not foresee the destruction of all your rockets and the collapse of your very clever plan," Carey said tactlessly.

Thorn's heavy features darkened and twitched with rage. His finger tightened on the Dongan unit. Then he smiled with glacial lips.

"Moorhouse has a certain modicum of brains," he admitted grudgingly. "He has annoyed me with pin pricks. But that is all over now."

Clyde watched him carefully. "You surrounded your ship with an area in which the electrical potential was higher than that of the charged atmosphere. As a result the lightning swerved away to seek lower potentials and left you unharmed."

"That is true," Thorn replied in some surprise. Unwilling admiration, not unmixed with fear, peeped out of his eyes. "Perhaps you know then how I found you."

"That was very simple," Moorhouse answered calmly. "Any member of a

Physics tribe could have done the same. A magnetic ray would dip sharply over the spot where our rocket lay hidden."

Kalen Thorn recovered himself. "And now," he inquired with a slight sneer, "perhaps you can foretell your own immediate fate."

"That is difficult. I am not a prophet. But this much I do know: you will try to kill us. You would much rather have first absorbed whatever knowledge I possess—you still are in the dark as to superdimensional tensors—but unfortunately your receiving helmet has been broken—probably from the force of the explosion you avoided—and so you intend to glut your hate with our immediate deaths."

Thorn's free hand went instinctively to his bare head.

"I do not need your petty knowledge, nor any one else's for that matter. I am the presence, and I know more than the combined human race. As for the helmet, I am beyond its need. If necessary, I could rebuild it."

"No; you could not," returned Clyde. "I purposely left the last equation out of the plans you stole and pretended were destroyed by fire. It is a tensor equation, of which you know absolutely nothing."

They faced each other, these two mighty antagonists, breathing hard. An electric tension filled the dimming confines of the buried rocket. Carey and Bascom on the one hand, and the two mercenaries on the other, watched with fascinated attention, forgetful of all else but the duel of these strange wills.

It was not man against man—it was man against the entire human race; lone knowledge against the collective knowledge of all time. And, strangely enough, it was Clyde Moorhouse, mild and slight, whose stature seemed to fill the cabin with majesty.

Thorn raised his Dongan unit. Its cone-like snout pointed directly at his

adversary's heart. His mercenaries leveled their weapons at Carry and Bascom. The slightest touch of the Dongan pellets was death. Fingers tensed on pressure-disks.

Bascom beld his leonine head proudly erect. He faced the muzzle with fearless eyes. Allan balanced on his toes. His knees flexed for a final desperate spring. If only he could reach Thorn, get his fingers on his throat before the Dongan pellets took effect, he would die content.

Clyde Moorhouse let his hand dangle carelessly near the curved wall behind him. He read the murderous purpose in Thorn's eyes, saw the pressure disk yield.

"If you shoot," he said conversationally, "we all die."

Thorn beld his hand, startled, suspicious. "What do you mean?"

"My hand is touching a concealed button in the beryllium lining. If I fall, my weight completes the circuit. There is fifty pounds of *dyxol* stored in a compartment behind the panel. Enough to blow our rocket and half the north pole into outer space."

"You lie!" Thorn cried, but his hand wavered uncertainly. Fear showed on the pallid faces of his mercenaries.

"If you think so," Moorhouse pointed out calmly, "you have only to shoot."

"Better not, your presence," one of the soldiers said hoarsely. "It may be the truth."

"Keep quiet!" Thorn snapped. He stared at the blank surface of the wall behind the Mathematician.

"There is no panel there, nor any button either," he decided.

Clyde shrugged indifferently. He stepped to one side, running his backward finger along the beryllium.

"You may examine it for yourself," he invited politely. "It's a hair line in the molding, rather than a button. I still am touching it."

THORN looked suspicious. His face clouded in thought. Suddenly he smiled. "Very well," he said, "I shall examine it. If the *dyxol* is there, I shall have to let you go, of course. But next time we—"

He winked imperceptibly to his men. "Follow me. Stand with your backs to the wall and keep them covered."

They understood. Strapped to the small of their backs were paralyzing units, used in hand-to-hand struggles to disable an adversary. A surreptitious movement started the current flowing. They acted by creating an ideal conduction medium for all forms of energy—electrical, mechanical, and chemical.

Contact with a human body, for example, diverted brain, muscle, and nerve impulses, intended for normal animal functions, into the units, which represented the line of least resistance. As a result brain messages never reached muscle tissue, nerve endings failed to report outer stimuli, and complete paralysis set in.

Backed against the hair line of the alleged wire, no circuit could be completed by any move on Moorhouse's part. The current would flow into the paralysis units instead of into a possible cache of *dyxol*.

The soldiers grinned and became masklike again. His presence in truth had a superhuman mind. They moved on rat feet in the wall, swerved around, pressed close and released the mechanism.

Thorn ran his hand along the wall. Clyde even moved over a bit to give him room. There was nothing, just as Thorn had anticipated. Moorhouse had bluffed—and lost.

Yet even if there was, his men were now in position. He had played the game with absolute safety, as became a man of his infinite intelligence. Only limited minds took chances.

"All right, men," he said suddenly; "let them have it!"

Carey cried out at the lightning-fast lift of the deadly snouts. He lunged forward, with the sickening sensation that the pellets would have lodged in his body long before he touched Thorn.

Moorhouse smiled at the staring weapons. He was at the farther end of the wall. He pressed an inconspicuous depression in the metal.

The whole side of the rocket seemed to disappear. One moment it was there, shimmily bright, silvery in color; the next it was gone, and a gray infinitude stretched impenetrably beyond. As if space and time and form had collapsed and a superspace had taken their place.

Thorn gave a startled cry and whiffed out like a blown candle. The Dongan pellets, pouring from the cone with tremendous velocity, as swiftly vanished. The mercenaries, guns spouting, merged into the gray matterless distance.

Allan, lunging forward, tried to check himself. For one horrible moment his feet slithered and slid on the slippery metal. He flung out a hand to catch at the sharply cut edge of the still-standing side. His clenching fingers slipped desperately along, within an inch of nothingness. Bascom sprang to snatch him back from the very brink.

"Good Heaven!" he gulped, the sweat of death cold on his brow. "Where is Thorn? What devil's magic have you employed, Moorhouse?"

Clyde looked strangely at the gray, featureless infinitude. "Keep away from it as you value your lives," he said. He was shuddering as though with cold. "It was a last resort. Thorn compelled me to do this to him. He should have died normally."

Allan exclaimed half angrily: "Pull yourself together, man. Thorn is dead. Don't talk gibberish."

Clyde passed a trembling hand over his forehead. "Thorn is not dead!"

"Then what—"

"He will never trouble us any more, nor any one else on earth. He is as

close to us as our own hands and feet, yet he might just as well be trillions of light-years away."

"That means you have transported him into another dimension?" Bascom asked, awed.

"Exactly! That gray void is the boundary. One step into it, and you are gone forever. I had this rocket specially constructed in my youth, when adventure beckoned and I was intoxicated with the strange tensor equations I had discovered. I intended making the tremendous journey myself. I can transport any part or all of this ship into extra-dimensional space."

Bascom moved quietly away from the walls.

Carey's eyes were aflame. "Why did you drop your idea?"

"Because," Moorhouse replied very softly, his gaze intent on the featureless gray, "at the last moment it dawned on me that the tensor equation I had employed was irreversible; that it was a one-way ticket. There was no return."

Carey said in a hushed voice: "I almost begrudge Kalen Thorn."

"Don't! You have never known the horrors of eternal exile; you do not know what horrors await him in that new dimension." Clyde shook his head as if to clear too morbid thoughts from his mind.

"Now we had better find ways and means of returning home."

Bascom roused himself. "That's easy. Kalen Thorn drove a passage through the drift to reach us. His rocket ship must be lying outside ready for use."

THE THREE outlaws reached the Hall of Science to find themselves the acclaimed heroes of a new world. The first act of Moorhouse was to destroy all the plans and equations Thorn had secreted for the construction of a new thought-reception helmet.

"It's too dangerous a weapon for



human frailty to employ," he answered Allan's protest. "We've had one example, and we want no more."

His next step was to reconvoke the General Council of the Tribes. He spoke long and to the point. Because Kalen Thorn had misused the advantages of cooperative science was no reason to swing to the opposite extreme of narrow individualism.

He suggested a new Tribe, to be called Coordinators. They were not to be specialists in any one branch of knowledge; they were to be trained from infancy in the ability to sense broad relationships, to pick unerringly essential facts out of a welter of data, and apply them to the construction of general theories. Thus, he maintained, would the human race forge ahead to new heights of civilization.

His suggestion was enthusiastically adopted. Clyde Moorhouse, by acclamation, was made first Coordinator of the new Tribe.

A GUARDING structure was placed around the seemingly illimitable area of the superdimensional space into which Thorn and his men had disappeared. For one thing it served to prevent wandering tribesmen from inadvertently falling through; for another it stood as a perpetual warning against any further attempts on the part of any individual to arrogate to himself tyrannical control over the earth and its people.

One of its most frequent visitors, however, was Allan Carey, who spent hours and days away from his proper duties as a Vector-Analyst to moon-dream before that eternal gray blankness.

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*In the April Issue:*

Campbell

Weinbaum

Bates

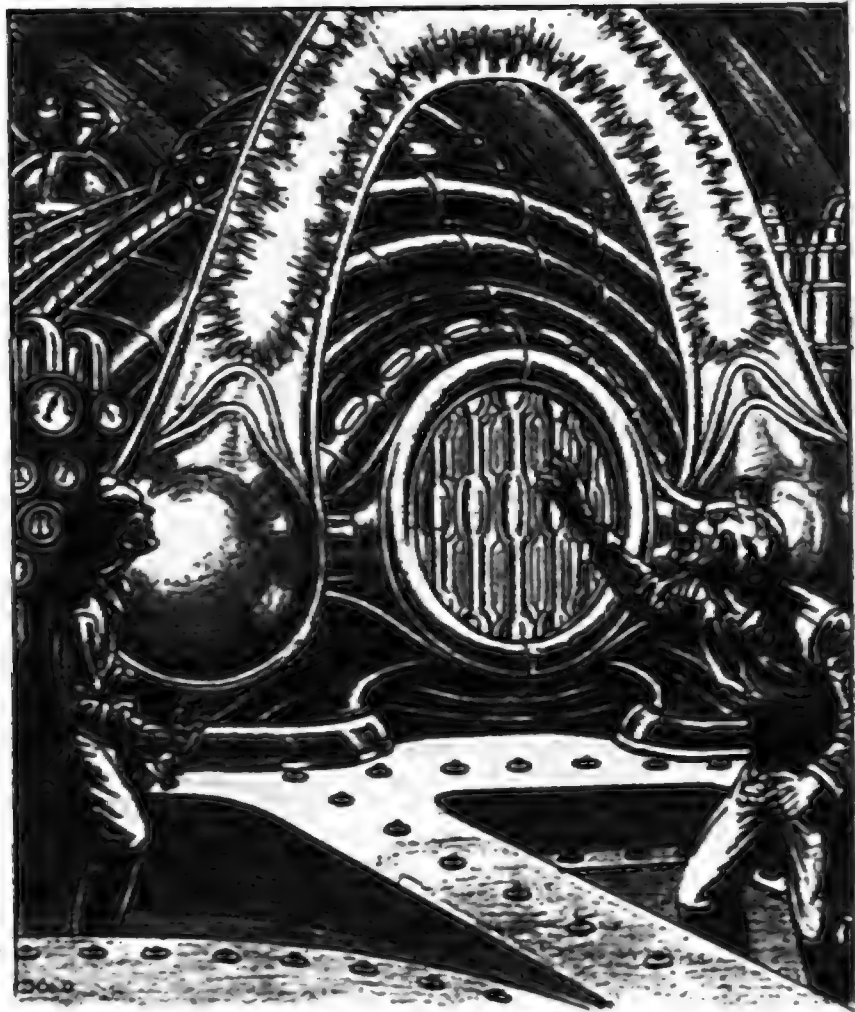
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Wandrei

*Another galaxy of stars with a real  
group of ASTOUNDING STORIES*

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# BLINDNESS

by Don A. Stuart

*Illustrated by Elliott Dold, Jr.*

**O**LD Dr. Malcolm Mackay is dead and, with more than usual truth, one may say he is at last at peace. His life was hard and bitter, those last few years. He was blind, of course, blinded as every one knew by

the three-year-long exposure to the intolerable light of the Sun.

And he was bitter, of course, as every one knew. But somehow they could not understand that; a man so great, so loved by the population of three worlds,

it seemed there could be nothing in his life to embitter him, nor in the respect and love of the worlds for him.

Some, rather unkindly, I feel, put it down to his blindness, and his age—he was eighty-seven when he died—and in this they were unjust. The acclaim his great discovery brought him was the thing which embittered him. You see, he didn't want acclaim for that; it was for the lesser invention he really wanted praise.

That the "Grand Old Man" may be better understood, I genuinely want people to understand better the story of his work. And his blindness, but not as most people speak of it. The blindness struck him long before the exposure to the Sun ruined his eyes. Perhaps I had better explain.

Malcolm Mackay was born in 1974, just one year after Cartwright finally succeeded in committing suicide as he had always wanted to—by dying of asphyxiation on the surface of the Moon, when his air gave out. He was three when Garrell was drowned in Lake Erie, after returning from Luna, the first man to reach Earth again, alive. He didn't go on living, of course, but he was alive when he reached Earth. That we knew.

Mackay was eleven, and interested, when Randolph's expedition returned with mineralogical specimens, and the records of a year's stay on the Moon.

Mackay went to Massachusetts Institute of Technology at seventeen, and was graduated a member of the class of 1995. But he took physics—atomic physics.

Mackay had seen that on atomic power rested the only real hope of really commercial, economically sound, interplanetary travel. He was sure of that at seventeen when he entered M. I. T. He was convinced when he was graduated—and went back for more, because about that same time old Douglas A.

Mackay died, and left him three quarters of a million.

Malcolm Mackay saw that the hand of Providence was stretched out to aid him. Money was the thing he'd needed. Mackay always claimed that money was a higher form of life; that it answered the three tests of life. It was sensitive to stimulation. It was able to grow by accretion. And finally—the most important, in Mackay's estimation—the old Scot pointed out it was capable of reproduction. So Malcolm Mackay put his in an incubator, a large trust company, and left it to reproduce as rapidly as possible.

He lived in shabby quarters, and in shabby clothes most of the time, so he'd have money later on, when he started his work. And he studied. Obviously, there is no question but that Mackay was one of the most highly intelligent human beings that ever lived. He started with the basis of atomic knowledge of that day, and he learned it all, too, and then he was ready to go ahead. He spent seventeen years at M. I. T. learning and teaching, till he felt that he had learned enough to make the teaching more of a nuisance than a worth-while use of his time.

By that time, the money had followed the laws of money, and life, and had reproduced itself, not once, but twice, for the Scot had picked a good company. He had two and a quarter millions.

There is no need to recall his early experiments. The story of the loss of three fingers on his left hand is an old one. The countless minor and semi-major explosions he had, the radiation burns he collected. But perhaps those burns weren't so wholly injurious as was thought, for thirty-five years after he left M. I. T. he was still working at an age when most men are retiring—either in coffins or wheel chairs. The Grand Old Man didn't put his final determination into action until he was seventy-three.



JOHN BURNS was his laboratory assistant and mechanic then. The loss of his fingers had been serious to him, because it made delicate instrument work difficult, and John Burns, thirty-two at the time, was his mechanic, his hand, and his highly technical assistant. In May, 2047, the latest experiment having revealed only highly interesting but negative results, Malcolm Mackay looked at Burns.

"John, that settled it," he said slowly. "Something is missing, and we won't get it here in a pair of lifetimes, even long ones. You know the only place we can find it."

"I suppose you mean the Sun," replied Burns sadly. "But since we can't get near enough to that, it doesn't do us a bit of good. Houston's the only man who has come back alive, and his nearest approach was 41,743,560 miles. And it didn't do any good, anyway. The automatic rockets get nearer, but not very much nearer, the heat beats them—all of them. And you, yourself, said we'd have to get within four millions, not four tens of millions of miles. And that's utterly hopeless. Nothing could stand it that close to old Sol."

"We're going," said Mackay grimly. "I've spent close to three quarters of a century working on the problem of atomic energy, and we're going." He paused a moment, then looked up at Burns with a kindly smile. "No; I guess it's not we who are going, but I. I'm more than willing to go, and lose perhaps two years off the tail end of my overlong life, if need be, if I can send back the word to the world that will set it free of that age-old problem of power."

"Power. Maybe we can use Sun power, after all. They've been talking about solar power since the beginning of the last century, and they haven't got it yet. Never will, I guess, because the power's too diluted. They can't build a big enough Sun glass. But if we can

steal the secret of the Sun, and give them little private suns right here on Earth, that will settle the question. And give rockets some real power too, incidentally."

The old man chuckled. "You know, John, when I started, it was the dream of my life that rockets should have atomic power so they could really reach the other planets. Atomic power! And now, here I am, close to three quarters of a century old—and I've never even left Earth. A grounder."

"And atomic power isn't so badly needed for rockets, anyway. They have good fuels now, safe ones and powerful ones like atomic hydrogen and oxygen. Atomic power is needed here on Earth, where factories are, and men labor in coal mines for fuel, and where they make the fuel for rockets. That's where mankind needs atomic power."

"And by all the powers of Heaven, if the Sun's where I can learn, the Sun's where I am going."

"But by that particular power of Heaven known as radiant energy, you can't," objected Burns. "The radiation makes it impossible."

"Well, I'll kill that radiation, somehow. That's the real problem now, I guess. Wonder how—we've developed a lot of different radiation screens and blocks since we began this work here; we ought to find something."

"Yes, doctor; we can stop any kind of radiation known, including Millikan, but we can't stop three or four million tons of it a second. It's not stopping it. Anything will do that. It's a problem we've never before attempted—the problem of handling it after it's stopped."

"We'll stop it and handle it, somehow," determined Mackay.

Burns gave up. Mackay meant it, so that was the new problem. It was obviously impossible, Burns knew, but so was atomic power, evidently. They'd



run against all the blind alleys in the universe seeking that, so they might as well try a few more in a different direction.

Malcolm threw himself into that problem with all the keenness and determination he had shown through fifty-five years of active research on the main line. This was just another obstacle on the main track. It stood between him and the Great Secret.

He experimented a little with photo-electric cells, because he felt the way to do it was to turn the heat into electric energy. Electricity is the only form of energy that can be stepped up or down. Radiant energy can be broken down from X ray to ultra-violet, to blue to red, to infra-heat. But it can't possibly be built up. Electricity can be built up or transformed down at will. So Mackay tried to turn heat into electricity.

He wasn't long in seeing the hopelessness of photo-cells. They absorbed some of the radiant energy as electricity, but about ninety-five per cent turned into straight molecular motion, known as heat, just as it did anywhere else.

Then he tried super-mirrors and gave up within three months. That was the wrong way. So it must be some way of turning molecular motion of heat into electric power.

It was like threading the way through a maze. You found all the blind alleys first, then there were only the right paths left. So he started on molecular motion-electricity transformations. He tried thermo-couple metals. They worked only when you had a cool place. A cool place! That was what he was trying to get. So he quit that.

Then he got mixed up with hysteresis. He was experimenting with magnets and alternating current and that gave him the right lead. He developed thermoelectricism nearly a year and a half later, in 2049, of course.

THE FIRST fragment of the new alloy was put in the coil, and heat treated till the proper conditioning had been obtained, and the secret of the heat treating is the whole secret, really. And finally it was taken out. It was dull, silvery gray, rather heavy, being nickel-iron-cobalt-carbon steel.

It looked like any of a thousand thousand other alloys, felt like any of them then. But they put it in the closed coil. In fifteen seconds dew formed on it, in twenty, frost, and the coil was getting hot, a current of fifty amperes flowing through it. Mackay beamed on it with joy. The obstacle had been removed! The way to the Sun was clear.

He announced his plans now to the news agencies, and to the Baldwin Rocket Foundry Co. They agreed to build him a ship according to his plans—and he made up his famous plans.

Thermoelectricism is a magnetic alloy, the unique property really being that its crystals are of almost exactly uniform size. When a magnet is turned end for end in a coil of wire, when the magnetic polarity is reversed, a current is induced in the circuit, at the expense of the energy which turned the magnet.

In any permanent magnet, the crystals are tiny, individual magnets, all lined up with their north poles pointing the same way. In magnetized steel, if the bar is heated, the heat-motion of the molecules turns some of them around, with the result that the magnetism is lost. In thermoelectricism, even at low temperatures, the crystals turn—but they all turn together. The result is the same as though the bar had been inverted. A current is induced in the surrounding coil. And, of course, the energy which inverts the magnet, and drives the current of electricity, is the molecular motion known as heat. Heat was conquered!

Dr. Mackay drove his plans on to rapid completion. Burns insisted on go-



ing, and Mackay could not dissuade him.

The plans were strange. They were enough to dissuade any normal man. Only such a fanatic as Dr. Mackay, really was, and as Burns had become, could have imagined them. Either that, or a man with colossal self-conceit. The *Prometheus* was to leave from Luna. Then she was to circle down toward the Sun, down very, very nearly one hundred million miles till she was within three million miles of the million-mile globe of incandescent fury, and stop her fall by going into a close, circular orbit.

That means less, to-day. No one had ever imagined attempting anything like that. Houston, who had circled the Sun, had actually merely swung in on a comet's orbit, and let his momentum carry him away again. That wasn't difficult. But to break the vast, parabolic orbit a body would naturally attain in falling from Earth toward the Sun would require every pound of fuel the *Prometheus* could carry and break free of Luna.

The *Prometheus* could set up her orbit about the Sun. That was going to be easy. But they couldn't possibly pull loose with any known power. Only atomic power could do it. When and if they found it!

Malcolm Mackay was eager to bet his life on that proposition. Atomic energy or—eternal captivity—death. And Burns, as much a fanatic as Mackay, was willing, too.

There were only two horns to this dilemma. There was no third to escape on, no going between them. So the Grand Old Man sank every penny of his fortune in it, and would have sunk any he could borrow had he been able to get it.

The *Prometheus* rose, slowly. And during the weeks and months it was being built, Mackay and Burns spent their time gathering supplies, instruments,

chemicals. For one thing, every element must be represented, and in proportion to its availability. Radium even, though radium could never be a source of atomic power, for power derived from radium would still be too expensive for commercial use. But radium might be the absolutely essential primer for the engine—so radium went. And fluorine, the deadly, unmanageable halogen, everything.

Then, gradually, the things were moved in as the ship neared completion. The outer hull of the high-temperature tungsten steel, the space filled with hydrogen under pressure, since hydrogen was the best conductor of heat practicable, and in that interspace, the thousands of thermoelectric elements, and fans to force circulation.

The *Prometheus* was a beautiful ship when she was finished. She glowed with the gleam of a telescope mirror, polished to the ultimate. Only on one side was she black, black as space, and, here, studded with huge projectors and heaters. The power inevitably generated in absorbing the heat in the therm elements would be cast out here in tungsten bars thick as a man's arm, and glowing white-hot in an atmosphere of hydrogen gas.

She left, finally. Struggling up from Earth, she reached Luna, her first stage, and filled her fuel tanks to the last possible ounce. Then, in August, 2050, she took off at length.

REACHING the Sun was no trick at all, once she had broken free of the Moon and of Earth. Day after day she fell with steadily mounting speed. The Sun loomed larger, hotter. The great gyroscopes went into action, and the *Prometheus* turned its silvered face to the Sun, reflecting the flooding heat. Nearer and nearer. Venus fell behind, then Mercury's orbit at last.

They knew heat then. And radiation. The Sun loomed gigantic, a titanic fur-



race whose flames reached out a quarter of a million miles. The therm elements began to function, and the heat dropped somewhat. Then the rockets started again, started their braking action, slowly, steadily, breaking the ship to the orbit it must make, close about the Sun.

Hour after hour they drooped and roared and rumbled, and the heat mounted, for all the straining power of the therm elements. Radio to Earth stopped the second day of the braking. The flooding radiations of the Sun killed it. They could still send, they knew, but they could not receive. Their signals were received by stations on the Moon, where the washing static of the Sun did not blanket all the signals that came. For they were beaming their waves, and the Sun, of course, was not.

"We must establish the orbit soon, John," said Mackay, at last. He was lying down on his couch, sick and weak with the changing strains. "I am an old man, I fear, and I may not be able to endure much more of this."

"We will have to brake more sharply then, Dr. Mackay," replied Burns concernedly. "And then we may not be able to establish the perfectly circular orbit we need."

Mackay smiled faintly, grimly. "If it is not soon, John, no orbit will mean anything to me."

The rockets roared louder, and the ship slowed more rapidly. But it was three days yet before the orbit trimming could have been started. They left the ship in an eccentric orbit at first, though, and counteracted for the librations of the ship, which tended to turn the blackened radiator side toward the Sun, by working the gyroscope planes.

Dr. Mackay recuperated slowly. It was three weeks actually, three, precious, oxygen-consuming weeks, before they started the final orbit trimming. Then day after day they worked, ob-

serving, and occasionally giving a slight added rocket thrust for orbit trimming.

But finally, at a distance of three point seven three millions of miles, the *Prometheus* circled the titanic star. The sunward side, for all its polish, glowed red-hot continuously. And the inside of the ship remained a heated, desiccated furnace, for all the work of the therm elements. Even they could not perfectly handle the heat.

"Ah, John," said Mackay at last, "in some ways Earth was better, for here we have strange conditions. I wish we could get a time signal from Earth. The space is distorted here by the Sun."

Old Sol, mighty in mass and power, was warping space so that spectrum lines were not the same, their instruments were not the same, the titanic electric and magnetic fields threw their delicate apparatus awry. But they worked.

It was fortunate the therm elements produced power, as well as getting rid of the heat. With the power, they kept the functions of the ship running, breaking down the water formed in their breathing to oxygen once more, and storing the hydrogen in one of the now empty fuel tanks.

And their observations went on, and their calculations. In six months it seemed they had never known another life than this of intolerable, blinding light if they dared to open an observation slit in the slightest; intolerable, deadly radiation if they dared to step beyond the protected walls of their laboratory and living quarters to the storage quarters without a protective suit. For the most of the ship was as transparent to the ultra-short waves of the Sun as empty space.

But it grew to be a habit with them, the sending of the daily, negative reports, the impossibility of hearing any signal from Earth, even of observing it, for there was the eternal *Gegen-schein*. It was blinding here, the re-



lected light from the thin-strewn dust of the Sun.

That dust was slowing them down, of course. They were, actually, spiraling in toward the Sun. In some seventy-five years they would have been within reach of the prominences. But before then—one of the pans of their balance would have tipped. Atomic power—or the inevitable end.

But Mackay was happy here. His eyes turned from deep blue-gray to a pale blue with red, bloodshot balls, his skin turned first deep, deep brown from the filtering ultra-violet, then it became mottled and unhealthy. Burns' skin changed, too, but his eyes endured better, for he was younger. Still, Mackay felt sure of his goal. He looked down into the flaming heart of a Sun spot, and he examined the under side of a prominence, and he watched the ebb and flow of Sol's titanic tides of white-hot gas.

2050 passed into history, and 2051 and 2052 followed in swift succession. No hint of the great happenings of Earth and the planets reached there, only the awful burning of the Sun—and, in February of 2053, a hint of the great changes there.

"JOHN," said Mackay softly one day, "John—I think I see some hint of the secret. I think we may make it, John!"

Burns looked at the sharp-lined spectrum that lay on the table before Mackay, and at the pages of calculations and measurements and at the data sheets. "I don't see anything much different in that, doctor. Isn't it another will-o'-the-wisp?"

"I—I hope not, John. Don't you see this—this little line here? Do you recognize it?"

"No—no, I don't think I do," he said slowly. "It's a bit too high for the 4781 line. And I don't know what's in there——"

"There isn't any there, John," said Mackay softly. "There isn't any. It's a forbidden line, an impossible line. It's the impossible line of sodium, John. It's a transformation that just couldn't take place. And it did, so I'm going to find out how it did. If I can make the impossible release take place the same way——"

"But that tells so little, so very little. Even if you could duplicate that change, make that line, you'd still be as far from the secret as from Sirius. Or Earth for that matter."

"I'll know more, though, John. You forget that only knowledge is the real secret. When I know all about the atom, I'll know how to do what I want to do. If I know all the changes that can take place, and why, then I can make that other change. Ah, if only I could see just a few miles deeper into the heart of the Sun——"

"We've seen some of the greatest Sun spots in history, and at close hand. Do you think we could see any deeper? The light—that terrible light."

"It blinds even the instruments, so there is little more we can do. But we can calculate and take more photographs for more of those lines. But now I must see what the instruments recorded when we got this line."

They recorded even more than the old man had hoped. It was enough. They duplicated that impossible line, and then they produced some more impossible lines. It was the key. It wasn't impossibly difficult then. They could design the apparatus, and did, in September, three years and one month after lifting off for the final drop to the Sun.

They made it, piece by piece, and tested it in January. It wasn't winter there; there was no winter. Only everlasting heat. And Mackay's eyes were failing rapidly. His work was over. Both because he could scarcely work any longer, and because, on January 14, 2054, the energy of the atom was har-



nessed by man! The Great Secret was discovered.

It took the intense light of the mighty arc to stimulate the old eyes when the thing was done. Only its tremendous blinding power was visible. His ears could hear its roar, well enough, and his fingers could feel the outlines of the hulking machine. But he could no longer make it out when it at last roared its lusty greeting to human ears.

HIS thin lips parted in a contented smile, though, as his tough, old fingers caressed the cold metal and the smooth, cold glass. "It works, doesn't it, John? It works. John, we've done it." A shadow passed over the old man's face for an instant. "We haven't heard from Earth in over three years. Do you suppose some one else has discovered it, too? I suppose I ought not to be selfish, but I do hope they haven't. I want to give this to the world.

"John, can you make the drive apparatus yourself?"

"Yes, doctor; I can. You had all the plans worked out, and they're simple to follow. It isn't really greatly different. Only that instead of using a high-temperature gas ejected at thousands of feet a second, we'll use a high-voltage ion ejected at thousands of miles a second. And because we can burn iron, as you predicted, we don't have to worry at all about power."

"No, John. We don't have to worry at all about power." The old man sighed, then chuckled contentedly. "I always wanted to live to see the day when atomic power ran the world. I guess I won't, after all. I can't see, but it won't matter. I have so few years left, I won't worry about a little thing like that. My work's done, anyway. We don't have to worry about power, John; the world doesn't any more.

"Men will never again have to worry about power. Never again will they have to grub in the Earth for fuels. Or

do things a hard way, because it is less costly of power. Power—power for all the world's industry. All the wheels of Earth's factories driven by the exploding atoms. The arctic heated to a garden by it. Vast Canada opened by it to human habitation, clear to the north pole. /

"No more smoke-clouded cities.

"And the atom will lift the load of labor from man's back. No more sweating for six hours every day for daily bread. An hour a day—and unlimited, infinite power. And, maybe, even, some day it will lead to successful transmutation, though I can't see it. I mean, I can't see it even mentally," he said with a little smile. "The Sun showed me the secrets it held—and took away the impious vision that gazed upon them.

"It is worth it. The world will have power—and my work is done.

"You are starting the drive apparatus?"

"Yes, doctor. The main tube is to be—"

Burns launched into a technical discussion. The doctor's eyes could not follow the plans, but the old mind was as keen as ever. It pictured every detail with a more penetrative vision than ever his eyes could. He chuckled contentedly as he thought of it.

"John, I have lost little, and gained more. I can see that tube better than you can. It's a metal tube, but I can see to its deepest heart, and I can even see the ions streaming out, slowly, precisely. My mind has a better eye than ever my body had, and now it is developing. I can see the tube when it is not yet, and I can see the heart of it, which you cannot.

"Make it up, John. We must hurry back."

The lathe hummed, powered by atomic energy, and the electric furnace glowed with a heat so intense the old scientist could see it, driven by the power of the bursting atoms.

The mental eye he had boasted of was keener, keener than his old eyes had ever been. But still it was blind. Somehow, it did not see the white-hot tungsten bars on the "night" side of the ship pouring thousands and thousands of kilowatts of power out into space. The power the therm elements were deriving from the cooling of the ship.

The drive tubes grew, and their great, metal bed bolts were turned. Then the great rocket tubes were sealed at the far end, cut, and insulated again. But now, electrically insulated. The great ion tubes took shape and were anchored, and the huge conductors ran back to the ion-gas chambers, and to the hunched bulk of the atomic engine. Day succeeded day, and Burns cut and fashioned the metal and welded it under the blazing power of the broken atoms in their atomic generator.

And at last the ship trembled with a new, soft surge. It must be slow, for the men were used now to weightlessness, three long years of it. But gradually, gradually the *Prometheus*, bearing the fire it had stolen from the Sun, swung swifter in its orbit, and spiraled out once more, slowly, slowly. And the radio drove out its beam toward Earth.

They could not hear the messages that Earth and Luna pounded back at them, but gladly they guessed them. The ion tubes whispered and murmured softly, with a slithering rustle as of a snake in dry leaves, and the ship accelerated steadily, slowly. They ran those tubes day and night and slowly increased the power. There was no need for maximum efficiency now. No need to care as they wasted their power. There was plenty more.

THEIR only difficulty was that, with the mighty ion tubes working, they could not receive radio signals, even when they had gradually circled out beyond Mercury, and finally Venus, slowly

growing accustomed once more to weight. They did not want to turn off their tubes, because they must get accustomed to weight once more, and they were moving very rapidly now, more and more rapidly, so that they passed Venus far too rapidly for the ships that rose from the planet to congratulate Dr. Mackay and tell him the great news.

They circled on, in the *Prometheus*, till they were used once more to Earth gravity, and then they were near Earth and had to apply the braking ion rockets.

"No stopping at the Moon, John." Malcolm Mackay smiled. "We and all humanity are through with that. We will go directly to Earth. We had best land in the Mojave desert. Tell them, tell them to keep away, for the ions will be dangerous."

John Burns drove out his message, and Earth loomed huge, and North America came slowly into view, then they were settling toward the desert.

The old scientist heard the faint, cold cry of ruptured air first, for his eyes were dark, and only his ears brought messages from outside. "That's air, John!" he cried suddenly. "We're in the air again! Earth's air! How far up are we?"

"Only another one hundred and fifty miles now, doctor. We're almost home."

"Home—I should like to see for just this second, to see it again. John—John, I'll never see Earth again. I'll never—but that means little. I'll hear it. I'll hear it and smell it in my nostrils, clean and sweet and moist, and I'll taste it in the air. Earth's air, John, thick and spicy with green things. It's autumn. I want to smell burning leaves again, John. And feel snow, and hear its soft caress on a glass pane, and hear the soft sounds men make in snow. I'm glad it's autumn. Spring has its smells, but they aren't so spicy and clean. They're not so interesting, when you can't see the color of the grass, so green—too bright, like a child's crayon

drawing. Colors—I'll miss them. There weren't any out there. Colors—I'll never see the leaves again, John.

"But I'll smell them, and I'll hear the hum and whisper of a thousand thousand atomic engines making the world over for mankind.

"Where are we? The air is shrilling thickly now."

"We're less than fifty miles up. They've cleared the Mojave for fifty miles around us, but, doctor, there's a hundred thousand private air cars there—a new design. They must have developed broadcast power. They're all individually powered and apparently by electrical means."

"Broadcast power? That is good. Then atomic energy will reach every home. The apparatus would be expensive, too expensive for homes."

"The air is full of ships—there are half a dozen great stratosphere ships flying near us now; can you hear the clag of their propellers?"

"Is that the noise—ah! Men, men again, John. I want to hear a thousand voices all at once."

Burns laughed recklessly, carefree. "You will, from the looks of things. You will! There's nearer a thousand thousand down there now!"

"The ship is slowing?" asked Mackay.

Burns was silent for a moment. Then, suddenly, the dry rustle of the tubes changed its note, it flared for an instant, there was a soft, grating thud, a harsh scraping of sand—and the ion tubes died in silence.

"The ship is stopped, doctor. We're home."

Dimly, faintly, the sound of a thousand voices clamoring and shouting came through the heavy walls. Mackay had landed! The Grand Old Man was back! And half the world had turned out to welcome him, the man who had remade all Earth, and all Venus.

The lock opened, and to Mackay came

the roar of voices, the thrum and hum, and rumble of thousands and tens of thousands of propellers. There were the musical cacophony of a thousand air-car signals, and the mighty thunder of a titanic voice, rumbling, hoarse, and god-like in power, cutting through, drowning it all.

"They're welcoming you, Dr. Mackay—welcoming you."

"So I hear," said Mackay, half happily, half sadly, "but I am so tired, perhaps I can rest a bit first. I am older than you are, John. You have done as much as I; you had better answer them."

Suddenly close-by human voices cut in, excited, happy, welcoming voices, and John Burns' swift, answering speech:

"He is tired; it has been hard for him. And—you know he has lost his sight. The radiation of the Sun so close. He would rather be taken where he can rest."

"Very well—but can't he say something? Just a few words?"

Burns looked back at the old man. Malcolm Mackay shook his head.

The man outside spoke again: "Very well. We will take him directly to anywhere he wants."

Mackay smiled slowly, thoughtfully. "Anywhere, anywhere I can smell the trees. I think I'd like to go to some place in the mountains where the air is sweet and spicy with pine smells. I will be feeling better in a few days—"

THEY took him to a private camp in the mountains. A ten-room "cabin," and they kept the world away, and a doctor took care of him. He slept and rested, and Burns came to see him twice the next day, but was hurried away. The next day and the next he did not come.

Because even Burns had not gathered quickly the meaning of all this. Even he had at first thought it was in orie-



bration of the invention of the atomic generator.

At last he had to come. He came into Mackay's room slowly. His pace told the blind man something was wrong.

"John—John, what's troubling you so?"

"Nothing; I was not sure you were awake."

Mackay thought for a few seconds and smiled. "That wasn't it, but—we will let it pass now. Do they want me to speak?"

"Yes. At the special meeting of the American Association for the Advancement of Science. And—also on the subject of the thermoelectric elements. You have done far more than you thought, doctor. You have remade the worlds already. Those cars I thought were powered by broadcast energy? I was wrong. We were blind to the possibilities of that lesser thing, the thermoelectric element. Those cars were powered by it, getting their energy from the heat of the air. All the industries of the world are powered by it. It is free power.

"The elements are cheap, small, simple beyond anything conceivable, a bar of common metal—a coil of wire. They require no control, no attention. And the energy costs nothing at all. Every home, every store, every man, has his private thermoelectric element. Every car and every vehicle is powered by it.

"And the map of the world has been twisted and changed by it in three short years. The tropics are the garden spot of the world. Square miles of land are cooled by giant thermoelectric installations, cities air-conditioned, till the power they develop becomes a nuisance, a thing they cannot get rid of. The tropics are habitable, and they have

been given a brisk, cool, controlled climate by your thermoelectric elements.

"Antarctica is heated by it! There are two mining developments that suck heat from that frozen air to make power in quantities they cannot use.

"And rocket fuel costs nothing! Nothing at all. The tropical countries find the electrolytic breaking down of water the only cheap, practical way to get rid of their vast energy, without turning it right back into heat. They give the gases to whosoever will take them away.

"And Venus you have remade. Venus had two large colonies already. They are cooled, made habitable, by the thermoelectric apparatus. A ten-dollar unit will cool and power an average house forever, without the slightest wear. By moving it outside in winter, it will warm and power it. But on Venus it is all cooling. They are developing the planet now. Dr. Mackay, you have remade the worlds!"

Dr. Mackay's face was blank. Slowly a great question was forming. A great, painful question. "But—but, John—what about—atomic energy?"

"One of the greatest space lines wants to contract for it, doctor. Their interplanetary ships need it."

"One?" cried the Grand Old Man. "One—what of the others?"

"There is only one interplanetary line. The lines to the Moon are not interplanetary—"

And Dr. Mackay caught the kindness in his tone.

"I see—I see—they can use the free gases from the tropics. Free power—less than nothing.

"Then the world doesn't want my atomic energy, does it?" he said softly. His old body seemed to droop.



# The Mightiest Machine

Part IV of the most thrilling novel to  
come from the pen of:

Illustrated by  
Elliott Gold, Jr.

John W. Campbell, Jr.

## UP TO NOW:

Aarn Munro, Jupiter-born son of Earth Colonists, Director of Physics Research for the Spencer Rocket Company, Don Carlisle, Director of Chemical Research, and Russ Spencer himself, President of the Spencer Company, grandson of the famous Spencer who built the first successful rocket, and founded the company, start out in the "Sunbeam," officially the "Spencer Research Laboratories No. 6," on a trial trip. The "Sunbeam" incorporates Aarn's three great inventions—the momentum wave drive, the anti-gravity field used not only to lift and protect the ship, but as a means of storing power in the so-called "oggie" coils, and the transon beams. The transon beams are conductive beams of SPACE, and can reach across space unlimited distances to tap the power of that mightiest of machines, a Sun of Space.

So powered, full-charged from the Sun itself, the ship starts out to find a top speed. They don't—but they find a small planetoid when they're going 40,000 miles a second. Protected by the magnetic atmosphere, the anti-gravity field, and the momentum waves, and backed by the vast power stolen from the Sun itself, they live, but the resultant strains tear space open, they are hurled out of this space, and into another—the space of the Sun, Aweel, and Magya.

Aarn is not the first of humans to suffer such an accident. Tens of thousands of years before, the Mo-jhay-ahy

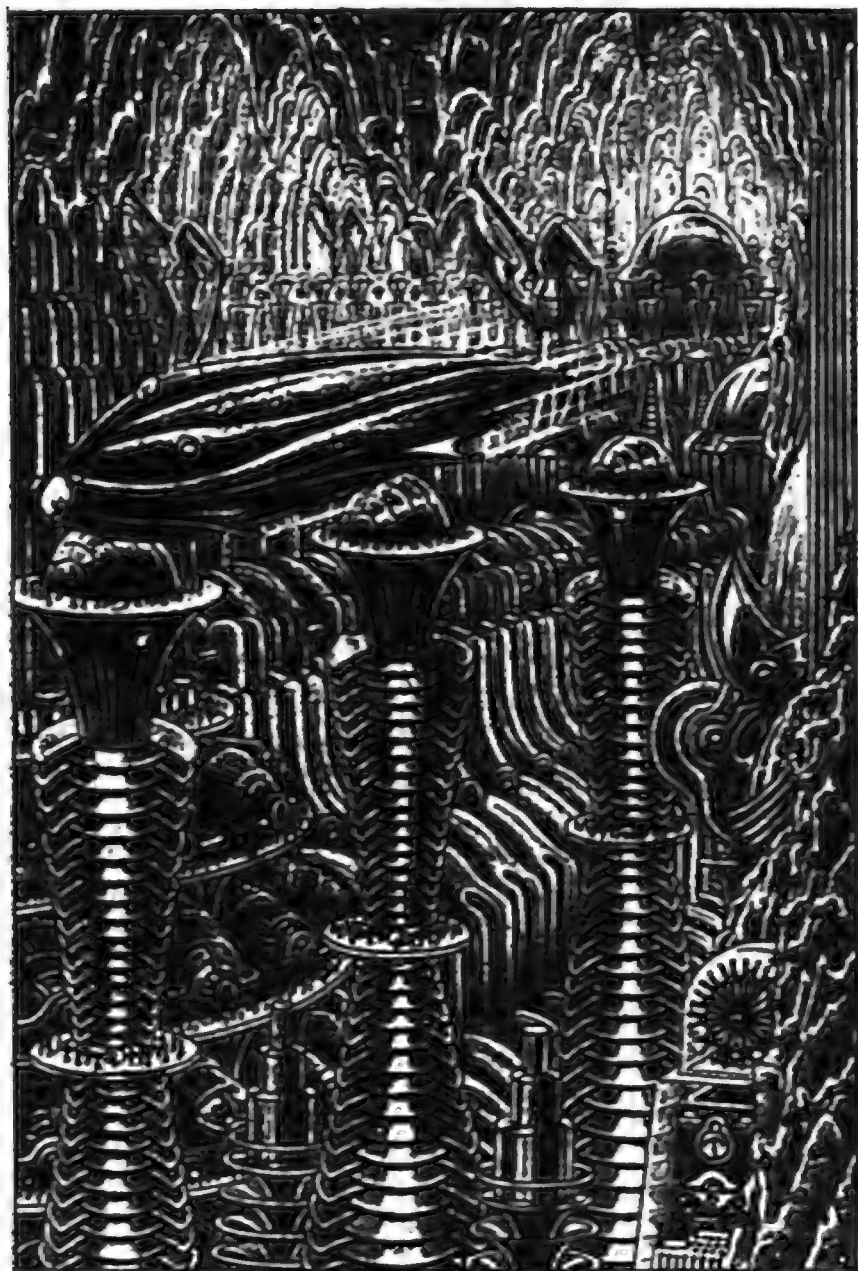
were great, and built up their civilization on the continent Maku. And from the caverns of the depths, the Tefi-hellani emerged, and with instinctive hatred the two races fought, for the Tefi-hellani were half goat-like, with hairy torsos, horns, and cloven hoofs for feet. In a last great effort, the Mo-jhay-ahy destroyed their continent, and the Tefi-hellani with them. But, knowing what was coming, they had hurriedly established some colonies, sent out expeditions hastily. All previous colonizing attempts had failed as the Tefi-hellani attacked. Now both Tefi-hellani and the mother continent were destroyed—save for two ships—one Tefi-hellani, and one remaining Mo-jhay-ahy ship. One of the newly-invented Tefi-hellani ships escaped, destroyed four of the five Mo-jhay-ahy ships, and as the two ships raced across the solar system in combat, the Last Continent of Mku sank beneath the Pacific.

These two, too, crashed into a planetoid, and were hurled through to the strange space of the titanic Sun Aweel and its 87 planets.

Each, separated from the other, thought the other destroyed, and settled in badly-damaged ships to the two worlds, and as millennia passed civilizations started by them fell, rose and again the races met to battle, across space

war.

Aarn and his friends feel toward the Tefians, as they are now called, the same instinctive hatred, and join their



*Into the huge, rough-shaped walls of the cavern,  
surrounded by every conceivable type of machinery!*

distant cousins, the Magyans, in an attempt to end this war, millennia old, against the ancient racial enemy, the Devils.

To the great weapons of the Magyans, the almost impregnable battleships, the Shal super-sonic torpedoes, and the ball lightning bombs, he adds the power stolen from the giant Sun Anrel, the transon beams used to throw power, ball magnetic and ball granitic bombs, and Carlisle adds Thermitic bombs.

With these new factors, despite the Teflex invention of super-sonic devices that crumble ships, and kill the men inside, the Teflex fleet is wiped out. Their planet, Teff-el, is still impregnable by reason of the circling orbital forts and the great planetary forts. So—the Magyans plan to hurl down two of their four moons to crush the planet! But if they do, the Kakkakill Relic Plates, which furnish the only clues to the space of Earth, will be lost forever. The tiny Investigator-machines have found them, in the Teflex temple-city, Kakkakill, and Aarn realizes a raid must be made.

#### XIV.

**O**UR SHIPS," Aarn was explaining, "must be small enough to be almost invisible, yet large enough to have the power we need. And for that fool chemical apparatus Carlisle put in. You said I should get an explanation of that soon——"

"Uh-hu! Just, paying you back some of your own. You can wait till we're ready this time." Spencer nodded with a grin.

"Well—the ships are made. And, after that glimpse we got of Kakkakill, I've done something—I've had them painted with a smoky violet color that will make them almost invisible in the higher reaches of that place. It's so darned dim in there they won't spot us, and we can make use of televisors for sight, and have no lights visible."

"Are those televisors going to be equipped with heat-eye apparatus?"

"Certainly. And we'll need them. Remember how dark it was in that particular vault. They are demountable. We can take them out of their port hole in a few seconds, and use them to guide us around without the necessity of lights. They weigh only about as much as one of those pistols—and look out how you aim those pistols, by the way, they'll blow up anything within fifty feet of you so hard they'll probably hurt you—and they will enable us to get along without light.

"Ummm—wonder if they're any good?" said Spencer, picking up one of the compact oblong devices Aarn had gestured toward.

He picked it up, pushed a stud, and watched an image form on the view-plate with perfect clarity, but with the typical appearance of a heat-image. Spencer pulled something the size of a hen's egg from his pocket, held it out at arm's length, and dropped it gracefully.

It hit with a dull, hollow plop, and burst into an instant, spreading blackness! In a fraction of a second the room was in utter blackness, a jet night so intense that the powerful glow lamps of the laboratory were utterly lost. There was nothing but a solid, impenetrable wall of blackness.

"Good lord, what is that?" gasped Aarn. "Hey—where in blazes are you? I can't—say I can't see my hand when it's touching my face. Uh—here's a light now——"

Silence. A chuckle from Spencer. "It won't work——"

"Haw!" Spencer looked at the screen of his heat-eye televisior, and grinned wider.

As though through a slight, bright fog, he could see Aarn, shining brightly, and holding a flash-lamp that was shining equally brightly, but seemed to be curiously affected by the fog. "It's

working. It just can't light, can't send a beam. Put it about half an inch from your eye, and you can see it."

Aarn did. "Sweet swinging satellites—what a fog that ink makes! What in space is it?"

"Infra - infra - infra fluorescence." Spencer grinned. "And your heat-eye works beautifully. That's what friend Carlisle made for the occasion of our raid. The chemical tanks contain a load of this. It combines with the oxygen of the air to form a chemical dye in particles so tiny they are close to the brownian limits, and won't settle out in less than about three hours under Tef-el's gravity."

"Infra-infra—and so forth. I think I commence to understand. Will you kindly supply me with one of those heat-visors so I can see my way out? What do you do to use it in this?"

"Stick it so close to your eyes, and turn it up so far that you can see it. This fog isn't utterly impenetrable, you know."

"No—but if I am right, it would be darned near it. I take it that this stuff acts the way fluorescence does with ultra-violet. It takes ultra-violet, and reduces it to visible light. This takes visible, and reduces it to infra-visible. Right?"

"Quite right. The heat-visor is somewhat obscured, because that re-radiation of heat by the little particles of the dye makes a foglike breaking up of the light, and also the heat."

"Hmmm—but this will be handy, indeed. Now I'll show you the ships."

Aarn led the way, equipped now with a vision device, up to the level where his ships had been stored. They were two specially built spy ships, one-man craft, about ten feet long, by three feet in diameter. They were equipped with surprisingly powerful weapons, and were able to exceed the speed of light. Their bulk was practically all taken up by power coils. At the nose was the

control compartment, and here the vision devices had been installed.

The controls were standard, save for the release working the darkness device which Carlisle had installed himself. With Spencer's aid, he had arranged it so that streams of the liquid chemical would shoot in all directions from the little ship with tremendous force, making an effective darkness nearly five hundred feet in diameter.

"I don't see why," said Carlisle coming up. "I'm not included in this little venture."

"Excellent reason. Speakum Aing-itch. We might get caught, you know—be a good thing if you could skip around—via investigator—and learn what's what with us, and let us tell you so they wouldn't know what our plans were. They know Magyan. They don't know English. Ergo: English is the thing to use."

"And since the Moon is constituted of green cheese—Of course Spence couldn't speak English. You, I'll admit, have advantages, with that mind-under-matter body of yours, that gorilla-patterned, Neanderthal nit-wit construction. But Spence—"

"Spence is a virtuoso of the control board, a master of movements, a commander of the keys. He can turn three back-somersaults, six corkscrew twists, and in inverted double-barreled upside down backward flight while you unravel your eyes from watching him," grinned Aarn. "Sorry, Carlisle—we've got to leave one representative, and I guess you're elected."

"I know it," admitted Carlisle. "Good luck. I'll be watching—"

THE TWO little ships rose, and spun gracefully out through the entrance way, and finally, passing through the lock, into free space. They swooped rapidly away from the great metal side of the battleship, and darted, faster than light, toward Tef-el. Both knew



perfectly well that, were they captured, rescue would be beyond any possibility. They were going in two parties, because it doubled their chances of escape, if detected. Spencer would go first, once they landed, for, were he caught, Aarn would make a far more deadly rescue force than Spence.

Faster than light they whirled by the defensive orbital forts, and the savagely circling swift cruisers Tef-el had sent out to watch the Magran fleet, and whisked into the atmosphere of the planet itself. Before the ships were stopped to a planetary speed in mere miles. In that peculiar condition by which speeds greater than that of light were possible, they seemed to be moving at a quite normal rate, they were able to control their motion readily.

In the atmosphere, they slanted down instantly, till their smoke-colored ships were lost against the dark background of night Tef-el. The ships were being driven only by momentum-drive now, no antigravity power was used, lest they be detected.

Kakdakil was near. In seconds they dived into the black hole that was the entrance. A sentry ship hung there, watching the incoming traffic, but as the two smoke-colored ships dropped down, they flashed the correct pass signal of light and dropped on unblinded.

Lightless, high in the great dusky dome of the cathedral city they swept on, so close to the ceiling they were bathed in the violet glow of the tiny hidden lamps. From their present position, a dozen other structures were visible, and swiftly the ships dived, when they reached a dimly lighted corner of the great cavern, and with an infinite skill landed noiselessly and lightly on a stone porch of a deserted, lightless prayer house. Not till the great sacrifice time would it be needed. Here the victim would be prepared—

"Let's hope we come back only once,"

whispered Aarn as he and Spence met outside their ships. "You go ahead."

With the assurance of an inhabitant, Spencer swung off along the pathway, his rubber-soled shoes making no sound. The light was dim, a golden mist of light produced by innumerable tiny bulbs hidden from the eye, but casting their soft glow on various objects that gave a gentle diffused glow everywhere. Swiftly, and with assurance, Spence made for the great temple of Kakdakil.

Past the left hoof of the giant ruby statue—it was bound in a shoe of the curious red gold—on toward the Temple, the white marble faintly golden in the light.

No Teflan moved about here now, for this was the hour when every one save the watchmen slept, there was almost no activity. Only far across the great cavern could he see a Teflan guard at the mouth of each individual cavern. But at that distance Spence looked like a Teflan himself—for he had on a remarkably clever outfit that seemed to twist his legs and his body.

Behind him somewhere in the eternal golden dusk, Aarn slung along. No art could make his great thickset body seem a Teflan's so the trick had not been tried. Which was another reason why Spence went first.

Up the broad stairway, gleaming with more of those hidden projectors of gold and violet light, Spencer went—somewhat worried, for he must show clearly now—and his walk was not the lope of the Teflan's goatlike legs.

In a moment more he was within the shelter of the great majestic columns, mighty square columns that stretched in golden light up into the dusk-violet gloom under the heavy overhanging roof. Like a miniature of the vaster cathedral of the cavern, this overhanging marble ceiling was lined with tiny projectors, and the smoky violet haze hung motionless.

Quickly Spencer slipped on to the next row of pillars and slipped in among them. There were no shadows here—no spots of darkness.

Enormous doors of that reddish gold—the ash of the atomic engines of Tef-el and Magya he learned later—were swung between great, wondrously carved posts of amethyst, deep, deep violet, illuminated from within. The great golden doors were covered with bas-relief of scenes of mythological import, scenes from the tales of Earth, in the other space, even.

Beyond, inside, Spencer entered the comforting gloom of the deserted Temple. On, past the small prayer chambers, on to the museum beyond. Through a passage that branched in the utter darkness, his steps guided by the heat rays thrown off by his own body, he finally entered the museum section. Up a winding ramp, up to the third floor. Right, down a broad corridor, to a room lined with cases and tables.

IN THE center of the room, ranged under a glass case, were the eleven plates of data, worked out some thirty thousand years before, by a scientist, marooned by inexpressible time and an unimaginable distance from his home world, wondering what its fate might have been.

Something hummed softly in his hand, a slight screeching sounded, then a soft hiss of escaping air. Again the humming, the slight, almost inaudible screech, and a third and fourth time. Spencer lifted away in his hands a section of the hard, tough glass, cut out in a rough oblong by the efficient little Magyan cutter he had brought.

Each plate was about a quarter of an inch thick, and about ten inches square. One by one he lifted them out, and began to frown in troubled surprise as he did so. For each plate was heavy! The density of the metal was nearly twenty, each one weighed more than

fifteen pounds—considerably more. With a sinking feeling of horror, he realized that this one unconsidered, and perfectly simple physical fact, was going to get the expedition into serious trouble. His load was to have been the plates—his duty. But they were mere pages of data—their weight had not been considered. Aarn, far faster, far stronger, was to have been the defensive force. And with that single slip, their plans were thrown off badly. He could not carry something near two hundred pounds of metal plates in his arms, the little sacks he had brought would never bear up under that load.

He stood in momentary surprise and lightening thought. Aarn, with his enormous strength, could easily carry them, of course, but Aarn was to have met him below. There was no watchman in the museum, and he was supposed to get back to the portion where Aarn waited behind a pillar of safety—but if they were forced to make four trips through the museum—

A light tap-tap-tap on the soft, muffling, rubbery composition flooring suddenly attracted him. A sound almost inaudible, so faint he never would have heard it had he not been standing motionless, concentrated on thought and danger. Teflan hoofs trotting rapidly along—a squad of a dozen of them at least!

With a sudden breath of horrified amazement of his own stupidity he remembered the hiss of air as he opened the case. The gas in that case had been under pressure as a thief-trap!

"Sweet satellites—what an asteroid brain I've got," he groaned.

He rapidly pulled four darkness bombs from his pocket, threw them to the four corners of the room, and heard them burst with soft plops as the tapping hoofs of the Teflans approached rapidly. Light appeared down the corridor—then was blotted out by a sudden rising cloud of blackness. Spence

picked up his heat-visor, swung up a load of the metal plates in each of his sacks, hoping he had important ones, and slid for the doorway toward the rear—to see a group of Teflans sliding around the corner into view.

The first group was halted now, stretching hands out into the gloom, seeking to feel something. Sharp, high-pitched voices barked commands back and forth across the room, the two parties acquainting each other of the situation. Both parties were halted now.

They were spread across the doorway, holding hands. The leader of them was saying something. Probably meant for Spencer—thought him a mere thief no doubt.

Spencer looked doubtfully at the man on the end of one row, watched carefully and hopefully, and saw him release the hand of the next man for a second. The hands of the Teflans were just like his own—same five-fingered hands—not hairy. Spencer smiled grimly, and threw two more darkness bombs. Quickly, and noiselessly, he sped back and forth carrying his plates, depositing them near the doorway, and making another trip.

Then—he watched. The end man released his neighbor's hand again for an instant, and in that instant Spencer grasped the Teflan hand with a feeling of surging anger and loathing. With the other, his right, he snapped down hard on the back of the strange, thin neck, thanking Aarn's forethought in arranging a headpiece that would hold his heat-visor in place without use of hands.

Just the edge of his palm—it was soft—the Teflan's neck was soft—and skillfully wielded as it was, with a knowledge of Teflan anatomy acquired by interested study of Teflan skeletons, it was instantaneously, soundlessly fatal. The spinal cord severed before the creature was aware of danger, he slumped,

lowered by Spencer's grasping fingers, wounded in the loathsome, coarse hair that seemed to have individual, noisome life.

Then he realized suddenly that the Teflan on his side was saying something—asking something. Spencer knew he could never risk language—he was half stooping, that position had attracted the other's attention, but now, Spencer was busy arranging the plates on the other side of the doorway.

WITH a sudden startled shriek, as of terrified surprise Spencer dived into the museum room, pulled the Teflan with him—then releasing his hold and instantly stepping back. With a single, terrific heave he sent the body of the dead Teflan flying into the room on the heels of the now-staggering line of excited, shouting Teflan guards.

"So long, you're the goats for sure, this time!"

Spencer was on his way. The plates were a staggering load—but he had them all. The Teflans were creating a terrific fuss at finding the dead body of their companion inside the room. The line had been re-formed instantly, but now they were sure that some one was inside that room, and had killed one of their number.

Spencer was rapidly retracing his steps. He reached the main corridor that led from the museum proper to the prayer rooms without trouble, save for his staggering load. His arms were aching, his breath labored, and he knew he must stop soon. If only he could have packed those plates properly—

And he passed, unseeing, a guard who stood half concealed in the doorway of a side passage. Instantly the Teflan was out. But he paused in stupefied paralysis for a second before he struck. The thief was not a Teflan! It was a Magyan!

A mighty roar of warning—a cry of the information, and the Teflan was

on Spencer. Before he could drop his burden, powerful arms were wrapped about him, he fell, with the guard on top of him, and the weight of the plates added. In ten seconds of struggling he freed himself of the plates, and in another five seconds, the Teflan guard was flying through the air to smash with a broken neck.

Like jujitsu in the occident, Apache kicking in the orient, boxing was unknown here. The Teflan, however, had done his work. The squad above had heard, and had heard that a Magyan was among them! A Magyan, and the Death of the Year sacrifice so near—

A score of Teflans came galloping down the ramps, and Spencer threw the last of his darkness bombs. Instantly he realized that his heat-vision apparatus had been so thoroughly ruined he had been looking through an empty framework! He was as blind as the Teflans.

With a groan he picked up his load of plates and set off as best he could. "Aarn will be coming—I'd better let him take these plates and beat it for the ship—"

Somewhere ahead a tremendous clang of metal sounded. With a start of surprise Spencer realized the huge grille of golden bars that hung before the main entrance had been lowered to bar his escape—and Aarn's entrance!

Half a dozen groping arms reached him simultaneously, as he reached the end of the black hall. Instantly the plates were dropped, and the nearest Teflan howled in agony as the heavy metal broke a bone.

"Look out, weakling," said a deep voice, just beside Spencer.

A Teflan rose suddenly from the ground, darted forward with speed so great he was a blur and smashed against two of his comrades—horribly.

"The plates—all there—weigh two hundred pounds—no heat visor—no light bombs—"

Spencer uppercut a Teflan, and suddenly realized that though they didn't have boxing, they had their own peculiar system. It depended on the fact that they had horns—and it was very deadly. With wonderfuladroitness Aarn raised his heavily booted, thick-muscled leg and planted his foot on a Teflan skull. The Teflans stopped attempting to use their horns after that demonstration.

The Joyian moved like a bounding ball of deadly destruction. His muscles found this planet's gravity weak, his thirty-foot bounds carried him in and out of the fight while his slower, weaker opponents saw him only as a flash of deadly striking flesh.

Aarn didn't use his hands alone—he used his legs, too. He didn't use his fists, because long since he had learned his muscles were too strong for the bones. He used his forearm with a chopping motion, and realized rather wonderingly that the Teflans' necks weren't as tough as a Terrestrial's.

In some thirty-five seconds the fight was over—the remaining Teflans being strewn all up the hall as Aarn charged after them. They could run more swiftly on their goat feet than any Terrestrial but the Joyian charged after them in great bounds.

SPENCER was sitting down, very busy being sick. "They—they're awful," he gasped when Aarn returned. "Let's get away."

"Uh-hu! Good idea," said Aarn. "Better do it fast. Those fellows were sort of police. Guess you set off some kind of alarm. They thought it was a thief and didn't carry any weapons." He picked up all the plates, some two hundred pounds of them, under his left arm, tucked his heat-visor under the other, and started off at a lope toward the doorway.

"We can't get out. I heard that grate fall."



"So did I. That's the only way I know to get out, though, so out we go," replied Aarn. They reached it in seconds, and the Jovian set down the plates tenderly and looked at the grate. The metal bars were an inch and a half thick. "Uhhh—bad. That's gold. Residue from their atomic engines. Sort of an ash. It's as good a conductor as copper, but heavy, and a bit soft. The point is, it's a good conductor." Aarn had lifted his heavy weapon, and pointed it at the junction of two of the crossed metal bars. "We'll see——"

The ball of blue electric force traveled straight and true, hit the junction, and was followed by about fifty others. The metal bars glowed red-hot—for several feet around.

"No go. The stuff won't melt, because it conducts both current and beats too well. I can't use my much more powerful magnetic balls on it, because the stuff won't absorb them. So that leaves——"

Aarn walked rapidly to the opposite side of the great grille and examined it carefully. The bars were in two planes, those running vertical were a little nearer than those running horizontally. Deliberately Aarn took hold of two of the bars and settled his squat, thick body comfortably.

"Keep your ears open," he said briefly—and went to work. The fine, elastic cloth of his shirt suddenly belged into tortured ridges that ran across his shoulders, and up his neck, and down to his hips. Huge wide strands of muscle rose and writhed and strained, muscles such as Hercules might have had, or Samson. Trained by a life time on the giant of the solar system, they were the muscles of a giant. They trained, and slowly, inevitably, the heavy metal bars bent, and turned, and suddenly sprang from their sockets.

Slowly Aarn straightened and stretched himself. He pulled the bars out of the way. "About two more——"

He grasped a horizontal bar now and began straining upward. His legs now took the strain. The muscles like broad, smooth rubber springs lifted themselves into ridges—and the great metal bar snapped out of its socket.

"Reinforcements, I take it," said Aarn, as he crawled through the gap.

He threw down a dozen of the anti-light bombs, and in the darkness took the metal plates as Spencer passed them through. Somewhere a steady marching tread was coming, the tread of several hundred feet. "We can't argue with the royal army."

Spencer dived through the gap in the grille, and suddenly realized that one of their own Investigator machines was hovering near them. Aarn saw it, and with a sudden leap grabbed it, and handed it to Spencer. "Carlisle can guide you to your ship with that—just follow its movements, and I won't have to lead you."

He had his heat-vision on and started off. For a few seconds the little investigator did not move, then Spencer felt it pulling steadily in the same direction Aarn was going and followed rapidly. Aarn was dropping bombs rapidly and despite the best efforts of the soldiery was avoiding them skillfully. Spencer was in worse plight, for Carlisle, millions of miles away, could not see and avoid the soldiers in time, and while the investigator would lead him to the ship, he had to look out for himself.

One soldier blundered against him—and died with a croak. Before a comrade found him Spencer was away.

AFTER long minutes, they reached their ships, Aarn was already in, and had deposited the plates when Spencer got there.

"Here's an extra heat-vision," said Aarn, handing the device to the engineer. "Snap it in. Turn loose your blackness."

In an instant the blackness was spreading through the great cathedral city. Ships—small commercial and private machines began to appear. But they hung outside the great cloud that spread, and finally were forced to stand motionless. Only a few foolhardy Teflans dived through the cloud as Aarn and Spence started out. The powerful magnetic bombs of the little spy ships brought down dozens of the attacking machines, but, as they reached the entrance, they saw a solid plug of a dozen ships in their path, with every evidence of staying there.

A dozen bombs—and the flaming wreckage dropped. Again the momentum drive lashed the machines on to full speed and up the shaft.

"There'll be a destroyer outside," said Aarn's voice cheerfully through the communicating radios. "He won't be waiting for us—he'll have his destructive beam on us already. Our only chance is to pray he isn't directly in line with the opening and dive out faster than light."

Spencer saw the rock of the opening running slowly away in slow dust as Aarn's words reached him—he threw his switch, and the tunnel mouth seemed to leap nearer. A great black shape loomed huge as they shot outward, a shape that was within inches of them. A cloud of hazy blue light leaped from Aarn's spy ship as he passed—Spencer saw it float slowly toward the bulk of the machine. Carlele, seconds later, saw it eat into the destroyer and leave a great gaping hole in the armor.

Two little spy ships raced out from Tef-el faster than the message to hunt them could follow.

## XV.

AARN looked up slowly from the careful translation the Magran scientists had handed him. "I need more time to study this," he said at length,

"for even your translation is not yet too clear to me, but I can say definitely that I can get through to that other space—my own home, by means of this diagrammatic data."

"That is good news. Both to us, and to you, for it means that we shall again be able to visit the ancient world, the world where our race was born," said Anto Rayl. "I hope we shall be welcome."

"You will, Anto Rayl, you will be more than welcome. For the first century of our contact, your people will be mobbed by all the anthropologists, philologists and most other oligists in the solar system.

"We will want to know as much about your race, as you will want to know about ours, and about the world from which you came."

Anto Rayl smiled. "For many years," he said, "the scientists of our people were greatly puzzled. There were a great many races of animals on this world—most of which have been killed off in the battle between our people and the Teflans, along with most of the large forms of vegetation—and none of these animals resembled our own race, yet all showed distinct traces of linkage. There was evolution among the various animal races, but no evolution that connected them with us."

"Not until the ancient myths of the Ma-jhay-anby and the Tef-bellani were so abundantly proved did the answer appear."

"It must have puzzled them," chuckled Spencer. "The scientists on our own planet, where all evolutionary strains were evident, had enough trouble convincing the bulk of the hide-bound people of the facts. You see, there was an ancient book, written by a race called the Jews, and this book was originally a sort of history of the race, half myth, half fact. As a mythological history it was well worthy of

study, but it contained a parable of creation which every one had taken literally for ages.

"Result: When science found the true story of creation written in the rocks, they could not convince the people who insisted the book was right."

"Man is a strange animal!"

"We have a religion, largely for those who want some higher power to believe in. Ma-ritha—the Lord of Life and Light. He was born of the Rocks of Earth, long ages before we came to this space, and for him our ancient land was named. He——"

Aarn had started at the name of the Magyan god. "Mithra! The name's a good bit different—but, Anto Rayl, he was born of the Rock, and tended by the shepherds, who adored him, and gave him gifts——"

"Then the story of Ma-ritha survived?"

"Yes—complete," replied Spencer; "even to his wrestling with the Sun."

"And speaking of Sun," interrupted Aarn, "let us consider the progress of the sunbeam. Have you got any reports on the beams, Anto Rayl?"

"Yes; the tapping beam has reached the Sun, and the energy flood is on its way back now. It will reach us in about ten days more. It has made great progress while you were seeking the Ancient Tablets."

"It has. How about the installations on Ma-kancee and Ma-ran?"

"We've finished the borings, and we have started installing the great supplies of power coils. But we have been rather waiting a conference with you."

"I'll help all I can, you know, Anto Rayl. What is it?"

"The Council of Warfare would like to discuss it with you. They have been preparing for this discussion, and will meet you in two hours."

"We will be there, Anto Rayl."

TWO HOURS later Aarn, Carlisle, and Spencer entered the great council room. The cavern was carved from a dark red rock, and lights of soft amber glow flooded walls and ceiling, reflected in soft shadowless illumination, enriched by blue decorations of twisting gas-glow tubes about the ceiling till the natural sunlight effect of Anrel was attained.

A great table of richly carved red gold occupied the center of the room. Gold, an ash, was common stuff to these men, useless save for decoration on planets where weight did not matter.

The Magyans were seated at the table, and Anto Rayl stood at attention beside the gray-haired powerful figure at the head.

"These are the Strangers!" announced Anto Rayl ceremoniously.

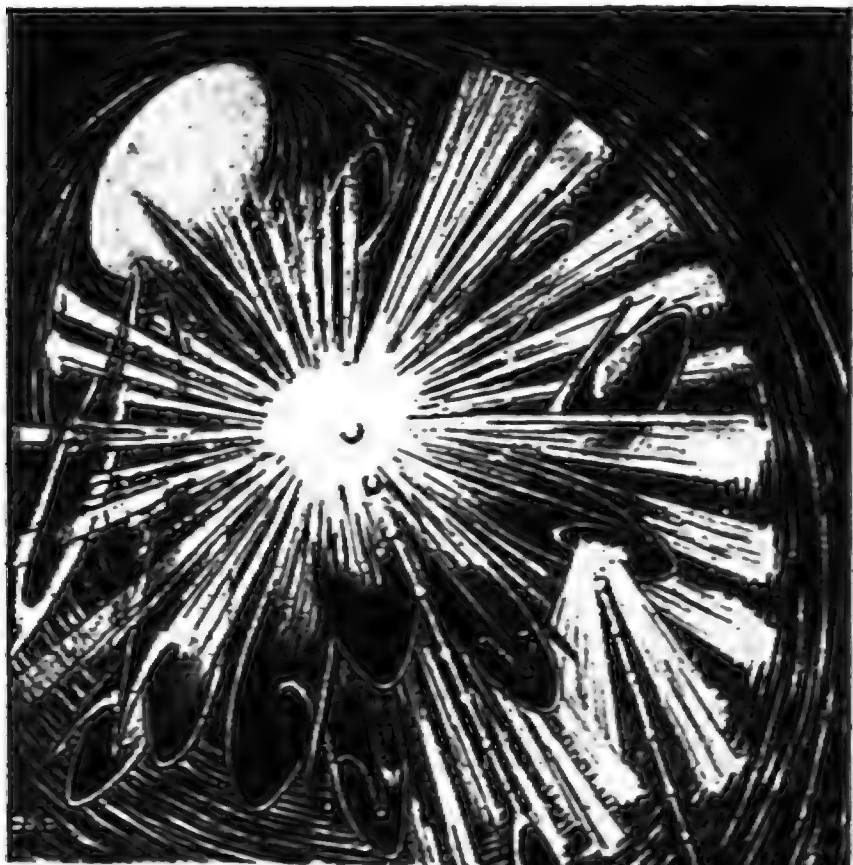
"Let the Strangers enter," said Andar Minot, the chief of council.

"The Strangers within thy cavern accept the invitation with thankfulness at heart," Aarn's deep voice replied. "We bring with us what help we can. We offer what aid is within the power of our limbs and our minds."

"Be seated, friends," said Andar Minot, rising, the ceremonial greeting over. "We have called on you again. Our plans are more exact, and an exact plan requires an exact answer."

"First: By careful measurement of effects of known forces, we have been able to determine with accuracy the mass of each of our moons. We now know with exactitude the load that the driving engines must move."

"Second: astronomers have been observing and calculating, and the plan is made exactly according to their results. The smaller of our missiles, Ma-ran will be used first. This will be torn from its orbit at a time when it is advantageously situated, and the acceleration of its orbital velocity will tear it loose in the exact direction we wish. It will then be projected——"



*The space seemed to grow larger and larger. Two little spyships sped out, faster than the order to stop them could follow.*

Carefully the plan was discussed, the movements of each of the moons considered. Ma-ran would be equipped with a huge driving engine that would tear it loose from its orbit, to hurl down on Tef-el and Tef-ran, and the orbital forts. Ma-ran, though far lighter than Ma-kanee, would have a driving engine of equal power, because Ma-ran would be expected to be mobile and capable of



real motion, be forced to pursue and catch the not entirely helpless orbital forts.

Ma-lancee on the other hand would merely hurl its quintillions of tons of mass on the planet—

The plan was made, and the work well under way. That same day Aarn and Spencer went out to Ma-lancee where the work was being done.

The little scout ship they were taken out on settled down near a great, arching glass dome, supported by heavy metal arches and braces. This had been an observatory, for nearly six hundred years actually, but now the instruments had been dismantled, the records carried to the two moons which would remain here. This loss of two moons would be a serious thing to Magya. They had used these moons both as forts and as observatories. They had permitted many experiments under varying gravitational strains. They had made possible many things that would no longer be possible.

Further, the stresses of tides would be suddenly relaxed, and despite their careful choice of locations for their cavern cities, this was always a terrible danger, since Magya-quakes might result that would shatter the roof of some cavern and release thousands of tons of rock. The moons would, however, spiral away through several revolutions of the planet, so the strains might adjust themselves gradually.

Here on the moon, the various organizations of mines, observatories, shipyards, and industries had been hastily shifted to the other moons. Ma-ran was small, and rather unimportant, but Ma-lancee was larger, and had been the seat of one of the greatest shipyards. This shipyard was now engaged in making the engines that would pull the satellite from the mother world. When this task was done, the apparatus would be transferred to the planet, salvaged so far as possible.

BESIDE the glass dome on Ma-ran was a great dark tunnel leading to the bowels of the satellite. The surface structures had been possible on Ma-ran for the same reason that battleships were possible—they were so dangerous that they need fear no Toffian ships.

No subterranean workings had existed. But now the tunnel led far below, and the scout ship slipped into it. Ten miles down, the tunnel was broken by a great air lock. The side of the great lock that plugged the entire enormous channel was a smaller lock, and to this their guide piloted his small ship.

"The large one is for the heavy freighters, carrying supplies. Takes power to pump all the air they need in locking. We use the back door." He smiled.

"What type of freighters have you? They weren't needed before. Did you use battleships for the task?" asked Spencer.

"Supply ships. We always had freighters. They were the heavy-load ships. They had to keep the fighters supplied when away from home. Remember they were filled with sun-power coils when you showed us how, but now this work has been going on, most of them have been taken apart, and the supplies of sun-power coils placed in these workings. We are making about one hundred large-size coils a day."

"And you need fifty thousand!" exclaimed Spencer. "Take a while yet, won't it?"

"Yes, but the capacity is being increased right along," the Magyan reminded him.

"How in blazes will they charge all those coils?" asked Carlisle. "They can't carry them back and forth to the Sun for power."

"Right. That's the why for of the Sun-tapping beam they set up way back yonder. The thing has been running about ninety days now, and the power

will be on hand soon. They have it set to pull in plenty—thanks to Aarn's advice. He told them it was easier to throw away extra power than to get along without power you needed. They can just tap the Sun-tapping beam from here and charge their coils all they want."

"They can tap the tapping beam? But what happens if they draw more power than the beam is bringing, and then when they get through, the beam brings as much power as they drew. I mean, if they draw too much power, more than the beam is carrying, and then don't draw enough power, and—oh, Lord, what happens, anyway?"

Aarn and Spencer burst out laughing, as Carlisle stopped in confusion.

"What happens if you drink more water than there is in the glass, and then when there is enough water, don't drink it?"

"But you can't drink more water than there is there——"

"We can't get more power than is coming. Right. Second, the signal for more power will go down the beam, but they can always use power, so we aren't worried about that."

The lock gate ahead of them opened, and the little ship went on into the depths of the moon, in atmosphere now, for air had been released in the huge excavation.

"What did they do with all the rock?" asked Carlisle at length.

"Planted it all over the surface of the planet—satellite rather—so they wouldn't lose any weight. They want all they can get to smash down on the Teflans."

Suddenly the dimly lighted, rough sides of the tunnel spread out into a brightly lighted cavern of huge size. A vast crew of men were laboring here, with machines of every description to aid them. The strange, screaming roar of Shal torpedoes was screeching at the rock, and the rock came cascading down

in fine dust to be caught in great vacuum machines and filtered out of the air instantly.

The caught dust was put in cartridges, and a pneumatic tube shot it up against the light gravity of the satellite and into the dome above, where the cartridge was emptied, and the dust thrown outside, the empty cartridge returned.

ON ONE side of the cavern, great metal frames had been set up, and already ranks and ranks of huge anti-gravity coils were set up.

"Those are charged," explained their guide. "They were taken from the supply ships which are acting as freighters, and are supplying the power for the works here now. Lights, power machinery—everything."

The cavern was being expanded in two dimensions, the floor and the ceiling being already determined. Artificial gravity plates had been installed in the place to make work easier, but the gravity had been reduced to only one-half normal for Magyas. The men, trained, soldier-mechanicians every one of them, were working under the commands of their officers, and rapidly setting up new racks of power machinery. Huge converters for the strange momentum oscillations were going in now. Bank after bank of oscillators.

"We have to drive conductors for miles through the rock in every direction to make certain we'd get perfect distribution of the momentum waves. That's the only reason we can move these moons, of course. If we'd had to depend on the space-drive disks it would have been impossible. Just torn the thing to pieces."

Here and there they could see dark tunnels still unfilled, borings where Shal torpedo after Shal torpedo had burrowed its way on and on. The borings were less than six inches in diameter, and hollow rods of aluminum

had been thrust deep into them, to spread the momentum waves through the planetoid.

The great control-board panels were slowly assuming shape in the major control room. "We'll have six television stations on the surface so arranged that we can see in every direction from in here. And we hope that you, Dr. Munro, will pilot Ma-ran in its flight on Tef-el!"

"If that is the will of the Council on Warfare, I would be glad to handle such a ship as this will be! A ship a hundred miles in diameter, weighing quadrillions and hundreds of quadrillions of tons!"

"Tef-el is as surely doomed as though Ma-ran were upon her now!" the Mag-yan exclaimed, a fire in his eyes that glowed at them in triumph. "At last this long battle our race has fought with the Teflans race will be ended—through your aid!"

"I don't like to be—what my people sometimes call a crane-hanger—but Tef-el was to have been crushed by the new ships equipped with the trans-poon beam and the magnetic and gravity bombs. She was not as thoroughly crushed as you and I expected. So never count Tef-el destroyed till her fragments hang before your eyes and clink against your ship."

"But nothing can withstand these incredible missiles! No energy could stop them."

"None that I can imagine. It is beyond the power of anything we know, certainly, but I would have said that a beam capable of disintegrating the armor of a mighty battleship was beyond the Teflans ingenuity. But—they destroyed battleships."

"But to stop such masses as these, they would first need something against which their momentum could be spent and—"

"Why stop them? Why not see to it they did not stop—let them miss Tef-

el, and we could not again work the trick in our lifetimes. Could we let them circle Anrel and strike again on the circuit, we might feel safer. Suppose they have some driving engine capable of turning these worlds aside?"

"Ay—there is the possibility—but I do not believe it," the Mag-yan concluded smilingly.

"How soon will you be finished with this work?" asked Carlisle.

"It will take us about seventy days more at our present rate of progress. The great delay of course is in getting sufficient storage of power. Our sun-beam won't bring us power rapidly enough, and we will want to have the greatest possible velocity when we finish our work. Of course Ma-kanee will do most of the destructive work to Tef-el, but we must do our equally important share, and the fleet will have its great work. The Teflans will be desperate. They will be very dangerous and fight with utter abandon."

ON MA-KANEE which they visited next, the work had not progressed as far, since a great deal of work had been needed in driving the three-hundred-and-fifty mile tunnel to the center of the sphere, and here, further, they found a metallic core. This was rather a help than a hindrance in some respects, however, for the tons and tons of metal were torn out of the center of the world with tremendous rejoicing.

"The fact is," explained their guide, "we have begun to plan on driving similar tunnels to the center of each of our other moons if we find it possible." They are both almost totally devoid of natural heat. For some reason we had just never thought of the possibility of getting the nickel-steel cores of the moons as a source of ready-refined armor plates!"

"Why stop with the moons? What's the matter with Magya itself?" asked Carlisle.



Spencer grinned and looked at Aarn.

Aarn answered: "It is possible on these moons because their gravities are low. I don't believe they will be able to do the trick with Ma-las. That's moon number two. That has a diameter of about one thousand miles and is so heavy that the surface gravity is really respectable. The result being that before they reach the center of the planet, the weight of the super-incumbent layers is so great per square inch that any metal, any substance there could be, is pressed into a sort of tarry state. Not liquid, but not solid. The pressure makes it run. The result is that it's impossible to drill a tunnel.

"On Magya, that condition is reached before you have gone ten miles down, to all practical intents and purposes. They couldn't tunnel deeper than that. If the metal core reached clear out there, they could go another half mile before it gave way, but rock, which composes that outer layer, yields.

"So they can't get the metal core of the planet."

"Nice cheap way to get armor plate!" Carlisle laughed. "Comes already alloyed, and all you have to do is saw out slabs."

"Don't you believe it! It has to be heat-treated for just one of many things. But the main thing is that the cost of drilling that tunnel is preposterous. The initial cost is so great that only the enormous amount of metal available can make it pay."

"Hmmm—that does make a difference. But, just the same, if they cut out much of that metal, Magya won't have to worry about battleship plate for centuries to come!"

"They don't intend to. That metal represents the main ballast of their deadly missile. They have to use it not as armor plate, but as an armor-piercing projectile."

Aarn gazed around the dim, raw cut that was rapidly being converted to a

work camp in the heart of the little world. The hard metal was yielding slowly to the combined efforts of great transpon-fusing beams and friction saws. The saws had edges of a tungsten carbide alloy and were driven by compressed air. They had a speed of revolution in the near neighborhood of 60,000 r. p. m., and a velocity at the circumference approaching two miles a second. They had no teeth, but the sheer wearing friction cut through the metal as if it was so much cheese.

A huge plug was sawn around, a plug some ten feet in diameter, and three feet thick. It was then fused out, and run into crucibles, promptly tapped into ingot molds, and shipped to the surface. There were some molds set up here, and the metal was being run into them to make various parts for the apparatus which would be needed, mainly frames to support soils and panels and great tie-beds for the momentum apparatus.

Lights were still being strung, and as yet no great supply of coils had been moved in. Only one small frame, for there was scarcely room for more.

They returned to Magya, and Aarn set to work on his necessary calculations. Days passed in which they scarcely saw him, for though they could sometimes help, in the main Aarn had retired into one of his silences. The old fellow who had calculated and observed had left his data in a form not too readily understandable to outsiders.

Perhaps he had not realized how many steps he was leaving out, since all was so plainly clear to him after the lifetime he had spent in gathering all the data. At any rate, many things had to be rechecked by Aarn, both for that reason, and to assure himself that certain figures were still good after the lapse of more than thirty thousand years of Earth-time.

In every case Aarn found the figures exact and still good.



HE LEFT his study occasionally—once to see the great sunbeam come in. The mighty star was sending back its floor of power now, after nearly one hundred and twenty days. There were, however, tremendous tides in the power, for Anrel was, as stated, a Cepheid variable, and the luminosity and power of the giant sun varied continuously. But steadily the power was pouring into the huge banks of coils in the heart of Mar-in. The coil banks here were completed, and filled before the coil banks in Ma-kanee were ready to absorb, then they took the drain. Part, of course, was used by the battleships and scout ships that continuously patrolled space, defending the planet and its satellites against attack.

And, down near Tef-el a fleet, a powerful fleet, was maintained to the disgust and terror of Tef-el. Time and again the seeking, prying investigators had pried out some secret of Tef-el, appeared suddenly, only to explode destroying valuable works.

The great central power plant at Katalakani had been wrecked by a dozen investigators, exploded simultaneously, and the tremendous concussion of the exploding mercury boiler had brought down the cavern. The atomic fires that had burned in the checking, controlling generators were released, and Katalakani became a complete wreck. A new fleet base was needed.

But the watch of the Teflans became more and more strict. The important secret places were carefully sealed so that it was impossible for any investigator to get in, and then carefully searched that they might be certain that none had already been secreted.

But the cities were still open to the investigators, and suddenly the Magyan watchers noticed a rapidly growing feeling of relief and joy. There was a secret abroad; the Teflans knew that a new invention had been made. But they did not know what. Only those in

charge knew, and they did not give it out.

"They say," said one Teflan merchantship commander to a fleet officer, "that this new thing will wipe out Magya—every damnable monstrosity on the planet; that the last sacrifice to Kak-ka was directly responsible."

"Ay—chun—it was a sad day for us, that last sacrifice. Malce Fasing, the daughter of Lecan Taol, was chosen, and old Lecan Taol went near mad at the thought. And then he heard that Magyans were sighted in the Temple—a raid. He was in Kakkakill with his daughter, of course, and he hastened to the capture—and was baffled in the black cloud. He saw the great golden gate, though, how the Magyan giant had sprung the bars like bits of wire—my faith, what strength the animal had—and be cursed.

"He cursed all the gods, and all men, and particularly all Magyans. Then some bumptious fool in the guards, hearing him, cursed him. He called him a fool of a chemist, a brainless old doddering wreck, and told him that the Magyan chemists had discovered a cloud of blackness that combined with the very air to hide them. Why couldn't he find something that would kill the Magyans?

"And Lecan Taol watched the sacrifice—of his daughter—and he partook of the sacrament—and he swore by Kak-ka and all the gods and the flesh and blood of that sacrifice that he'd end the struggle. And the rulers say he has!"

But what it was the Teflan chemist had discovered, no Teflan knew, and no Magyan found out.

## XVI.

"I CAN'T imagine what they have," Aarn sighed. "Apparently it's chemical. I hope it takes them a long time to make it. If it takes more than about eighty

days more, we'll be getting back home, and their little planet will just be a ring of asteroids."

"But I don't see how they can do—what they only hint we have claims. They said they'd take the air away from Magya. That's an obvious impossibility. The mass is so great that no possible chemical combustible agent they can have could combine with it."

"How's your work getting on?" Spencer added, seemingly irrelevantly.

"Done!" Aarn sighed with contentment. "I have the apparatus ordered, and the Magyans can make it with Canning's help. You saw the final result."

"Uhhmm—but you didn't test it."

"You brainless meteor, how could I? I could test it by going home, which I'm not prepared to do. I want to see the rest of this fight. I want to pilot Maran as she crashes down on Tef-el. I want to wipe out that race which has been mankind's personification of evil since time began. I want to see this thing—"

Anto Rayl's feet sounded in the hall outside, his breath coming in gasps. "Aarn—Aarn—they've started! Their weapon—it's fire! It's started on the night side—weird fire—it burns blue—come—"

The three Solarians were on their feet already, racing for the ports of the Sunbeam. In seconds Canning joined them and Martin.

Out of the city in an instant—behind a thousand little fleeing scout and spy ships.

"The fleet—Tefflan fleet—steaked out somehow—got out into space, and came within about ten million miles of Magya before they were detected. Hundreds of oversize scout ships. They dropped thousands and thousands of bombs. They were going slowly then, of course."

The bombs dropped to the planet. Painted black—on the night side—they have been discovered only now. The

fleet chased the Tefflan fleet away, and they thought that no damage had been done till the bombs began to land," Anto Rayl explained rapidly.

Around the world from the afternoon side where they were to the night side they raced. It was a weird sight that met them. Enormous tongues of flame that stretched shimmering and pale-blue a hundred miles into the stratosphere, pale, blue, wavering light. They marched and countermarched; they rose and fell, and always sank.

They started here and there. And they ended always on the ground. But flame, burning hot flames that were still mingled with the blue flame, and tinged, under powerful lights, with brown smoke. A dozen, darting, black silhouettes shot through the flames.

"Spy ships."

Aarn tuned in the radio. A Magyan's voice sounded sharp—

"The temperature of the flames is so low they would not burn human flesh. But the chemical activity is strange. The flames on the ground are exceedingly hot, the ground itself is becoming incandescent. The vapors given off are foul and poisonous. They are red-brown in color—"

"Great God in heaven! The catalyst!" Carlisle almost shrieked it. "Magya's doomed as sure as Tef-el if we can't stop that! It's the catalyst—the catalyst—don't you fools see—the nitrogen catalyst—the atmosphere here is sixty per cent nitrogen—twenty-one per cent oxygen—they've found the catalyst and the whole atmosphere of the planet is burning to foul, poisonous, burning nitro-compounds! The whole atmosphere is going—the catalyst is never used, and the atmosphere is burning itself away!"

Anto Rayl had gone pale; Aarn was looking pale, too.

"Certain?" he asked sharply.

"What else?" snapped Carlisle. "Tell them to get samples—even if it costs

lives. There's only one hope we can have. Only one way we can stop it if——"

"Attention—attention all Magran scouts and spies——" Anto Rayl had snatched the microphone from Aarn's hand. "Anto Rayl, C-8-N32 speaking—commander in chief of spies and scouts speaking. Listen, and all government forces listen: Carlisle, chemist of the Other Space, says this is a catalyst which causes oxygen and nitrogen to combine, burning up oxygen of the atmosphere. Deadly to us if not stopped. Get a sample. He needs it. Get enough for all chemists to work on. That is an order—C-8-N32 speaking."

Anto Rayl turned to the Solarians a bit sheepishly. "I am sorry I have not told you. Naturally we watched at first. Then I did not wish to say. It is by my orders you have seen so much lately—taken everywhere. I am the commander of all minor ships. Unlike your navies, we have a horizontal as well as a vertical command. It makes for closer unity of action. I am under the command of the Commander of the Council of Warfare only. I investigated your ship when it first appeared because we, too, saw the strange materialization and your defense."

"Now forgive me, and, Carlisle, if it is within your power, save us—this other-space branch of your own race."

THE WEIRD blue flames flared high, while on the ground they continued to glow, mingled with the brown fumes, and the red flare of normal burning.

Carlisle spoke rapidly: "The impossible catalyst. We've been looking for it for a century and a half. You see, nitrogen has one exothermic compound with oxygen—N2O5. That gives off heat in forming. Very little, comparatively, but some. That's why the flames were cold. N2O5 is the basis of nitric acid. It is a terrible oxidizing agent.

All the organic matter in the soil is burning.

"We want it because, controlled, it would generate free power from the air, and, more important, manufacture fixed nitrates for, literally, less than nothing at all. Uncontrolled, it is burning the precious oxygen and the nitrogen to form the deadly, corrosive nitric compounds.

"Every particle of organic matter will be attacked. It will dissolve in the oceans and poison every species of creature. It will burn the air till there is no air, and sucks it out of your cities and leaves the people poisoned, and gasping. The oxygen will go, and with the nitrogen, to such a little volume the air pressure will fall, and then, no amount of locks will save your cities forever——"

"Any luck?" asked Aarn, looking in at Carlisle.

The air in this room was very good, a little rich in oxygen. They were trying to help Carlisle all they could. In an air-tight retreat, Carlisle had a sample of the deadly stuff. He looked up at Aarn's entrance. His face was pale, and haggard, his eyes tired.

"Better take a rest, Carlisle," said Aarn.

"No luck. Can't analyze it. Hasn't a chemical formula. Can't rest—the air pressure has fallen so now they can't keep up the pressure inside. That's only twenty days of it. And we can't stop it. We've got to stop it."

"I know it. But you won't stop it being tired. Knock off for a while."

"Say, Aarn, why don't they fix the locks here. They say they can't keep up the air pressure because the locks leak so. But they don't fix them. I thought they were proof against gases. Designed to keep poisonous gases out, and guaranteed gas-tight."

"Uh—in the usual way," snorted Aarn. "They kept the poisonous gas

out by pushing the good air out faster than it could come in. Result—they never planned on this. Then, too, it wouldn't do a bit of good to fix the locks, and rocks leak."

"Rocks leak?"

"Certainly! Full of cracks that they never worried about. Porous, so that it can seep through. With a pressure difference of nearly ten pounds to the square inch, that means leakage. And they can't suck it in fast enough to keep it up. Men not on active duty are being kept asleep as much as possible. Use less air."

"Why can't they suck enough air in—build larger filters?"

"Time. They can't build them in time. They've started, of course. But, you see, they have to be proof against those ultra-microscopic particles. The worst of it is that it isn't the solid stuff that's doing the damage. Remember how terrible the gases were when they started the things—and the filters didn't get out the fine stuff."

"It killed thousands—we missed the worst of it in the Swabram. In the civilian cities it was worse because they didn't have ships to retire to while adjustments were made. The filters would easily handle this—if they didn't have to be nearly choked off to stop the fine stuff."

"I can't analyze this. I haven't found a poison for the catalyst. And I can't see any other way out. The rest of the chemists here are as helpless as I am."

CARLISLE turned wearily back to his work, and Aarn went out. He got into a little scout ship and was let out through a very small lock. In the twenty days that had passed, Magya had changed. The whole world was blanketed under a pall of white snow. But the snow was slushy and about two feet deep.

It glowed blue, and the air glowed with a dim blue haze, and a constant

rain of white crystals that fluttered gently down to add to the slush. There were no more red flames of burning organic material. That was all burned away long since. The air was full of the floating particles of the catalyst dust. The ground was covered with it. The water was full of it.

Thick, oily brooklets of thick nitric acid boiled and fumed brown as they crept down to the sea bearing their load of undissolved, solid nitric pentoxide. The streams hissed and boiled water and brown vapor as they met the sea and dissolved. The air outside, could it have been smelled by any living creature, was a burning, terrible poison. Billions of tons of atmosphere had already been burned away.

The burning was slower now, for each pound of nitrogen had carried down with it three pounds of oxygen, and the atmosphere was almost nothing but nitrogen and carbon dioxide. There was no water in the air, for the nitric oxide absorbed it, drank it greedily. The carbon dioxide was formed from every scrap of organic matter that had been on the planet.

There were no fish in the sea, no plant nor any animal on the land, and no bird in the air. The humus in the soil was burned; the very rocks were being eaten by the corrosive, oily stuff.

The nights were cold now, and the thick rivulets froze. The days were hot, and the snow melted under Aarn's rays and ran into the sea, liquid itself. The sea was an ocean of strong nitric acid. The very spy ship Aarn rode was being eaten slowly by the corrosive gas, and a trail of light brown fumes floated out behind.

Out on Magya's four moons there was a deadly activity. Men were working with the grim determination that Tef-el should die, even as Magya perished, for there was little hope. Even if the catalyst stopped now, they feared the end would be inevitable.



The air glowed blue, night and day. The great, clear stars of this space were invisible, for the light in the air hid them.

Aarn settled to the planet and opened a little trap. It closed, and as the ship rose there was a mass of nitric oxide in it. A moment later he had taken a similar sample from the water of the nitric-acid sea. Then he rose and at an altitude of ten thousand feet took a sample of the thin air.

Later, back in the city, Carlisle made a hurried test of the various samples. The catalyst, still active, was in the air, in the snow, and in the ocean. It was everywhere.

"They're still rejoicing on Tef-el," snapped Carlisle. "Spencer was in a while ago and said that Tef-el has at last made investigators, and there were some flying around on the planet recently. They're watching with glee."

Aarn's grin deepened. "Wait till they send investigators out to the moons."

"They have," snapped Carlisle. "They're examining the works carefully, I suppose."

"Oh, no, they aren't. They're discovering that the Magrans are preparing to move to the moons."

"They'll send the damnable catalyst there," groaned Carlisle.

"Much good may it do them. They probably have got the catalyst in there before this. But—they've changed the air in the moons to pure oxygen at reduced pressure. The catalyst can't find any nitrogen to work on."

AARN had slipped up behind Carlisle, and now he deftly slipped an arm about his friend, lifted him up and away from his bench, and as Carlisle opened his mouth in protest, Aarn popped a pill in it, and simultaneously grabbed his nose.

"Whoa—kiddie. Swallow nasty medicine like good little boy. Baby

boy's gotta sleep or he'll go clean off his orbit."

Perforce, Carlisle choked, and swallowed.

"Just a bit of your own pet diamorph. Give you a nice heavy sleep for twenty hours that you wouldn't take. Ah—baby's quieting down."

Carlisle wasn't—but Aarn's arms were quieting him. Carlisle was as helpless as any baby might have been, save that a child, being possessed of unlimited flexibility in his joints, can become incredibly hard to hold, and Carlisle couldn't. Aarn took him to his room aboard the Swabbeam and put him on the bunk.

"You might as well stay there now, Trolley Car, because I won't let you out, and you are just naturally bound to go to sleep pretty quick, anyway."

"I've got an antidote for this stuff," Carlisle snapped angrily. "You interfering half-witted physicist, I've got to find that catalyst poison."

"You moronic, subnormal idiot, you can't go without sleep indefinitely. You passed out twice in an experiment, so I'm just stopping you ahead of time this time—and you'll sleep. Nighty-night, you asteroid."

Aarn left. With a groan of utter, irresistible weariness Carlisle sank back into his bunk, and instantly was asleep.

Aarn went down to the control room and sat thinking. Aarn was not a chemist; he was a physicist, but like any scientist, he knew something of almost all others. He tried to recall what he knew of nitrogen, of oxygen, of their mutual behavior.

With a start he sat up, and finally got Carlisle's notes. "He writes a misbegotten sort of a hand," he said disgustedly, looking at the sloppy notes.

The book was spotted with everything imaginable, and in many places there were irregular holes that grew when looked at, the paper was so rotted by acids and bases.

Aarn sat down and at last came to what he wanted. A spectral analysis of the catalyst. Simple—this far. But how were those elements combined?

He looked at the list of them. And one he had rather hoped to see was there—titanium. With a sigh, he settled deeper and considered. Titanium, he remembered, was one of the few elements which burned readily in nitrogen; also oxygen. Perhaps that was the active principle.

If he could just find some substance that would combine with the titanium permanently—he'd suggest that to Carlisle when he woke up, anyway.

Spencer appeared presently, looking tired. "Been working out on Ma-ran. They're pushing the work. They have it almost all finished. Final plans called for an engine as powerful as the driving mechanism of Ma-kanee, but they've made it bigger. The air here's getting pretty bad. I hear they can't get oxygen. Why can't they take that

damnable residue outside and break it down?"

"The catalyst," said Aarn with a gentle sigh. "That, like the famous French phrase of the 1915's 'c'est la guerre', is the answer to all questions here at present. They can't get the catalyst out of the snow, or the liquid, and if they try to break it up, it just goes right back together, and the catalyst tends to escape into the air of the room—and that's why they don't do it."

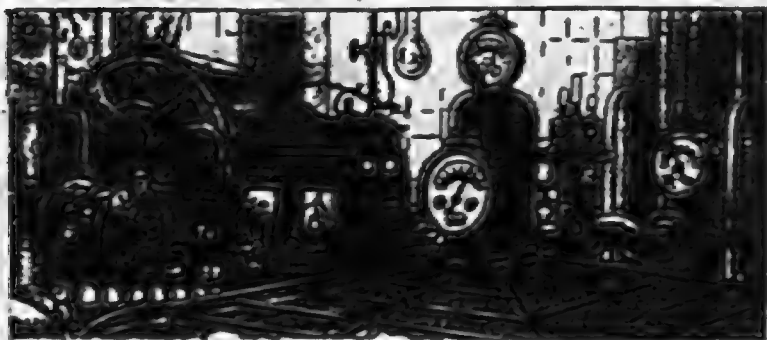
"Any hope, Aarn?"

"Ummm—if they smash those moons into Tef-el soon enough. Then we might move to some other planet—at least a lot of them could. Not all—but a lot. Might save the race, at least. Before Tef-el is smashed, the Teflans would kill the new colony."

"The moons will move in fifty days, smash Tef-el in sixty-three."

"The council says the population will be small enough to move into the warships in thirty at the present rate."

*To be continued.*



# Cardiaca Vera

*A story of medical science which might  
one day come true*

by Dr. Arch Carr

JAMES STEWART hesitated with the trocar poised for its plunge into the abdomen of the body before him. Then he stood erect, placed the instrument on a near-by shelf. For the eyes of the young woman on the porcelain embalming table had drifted slowly open.

This was by no means a new experience in Stewart's life. Many times he had seen the eyes of corpses come open, due to some process of rigor mortis in the facial muscles. But in this instance he was confident that no contracting cords or tendons had pulled those eyelids apart. He detected a difference that he could not explain.

A stethoscope applied to the cardiac region confirmed his belief. There was an almost imperceptible tremor of the heart; not a pronounced pulsation, but motion enough to indicate that there yet remained a faint spark of life.

Stewart glanced at the number card affixed to the girl's hand, strode between rows of death-laden caskets to a wall telephone and called the hospital that had delivered the supposedly dead girl.

He asked for the night superintendent and, when the connection had been made, said: "Avondale Morticians. Give me the history on body 218, please."

"Body 218," the voice on the line replied. "Female. Approximate age twenty-seven. Identity unestablished. Seized with heart attack on Oak Street at three p. m. to-day. Died at seven-

thirty without regaining consciousness. Cause of death, myocarditis. Examination revealed no other focal point of infection, no injury."

With a word of thanks Stewart hung up. After a moment of indecision he dialed another number.

"Stewart speaking, Dr. Murray. I think I've got what you want. . . . Yes. Young woman. Hospital gives heart disease as cause of death. . . . Yes; she's unconscious. Coming over? All right."

Stewart returned to stare thoughtfully for some time at the beautiful, yellow-haired girl on the grim, metal-topped table. He gave silent thanks to the kind providence that had prevented his embalming her, even though he knew that in her present physical condition she could live but a scant hour longer.

Nameless, she lay there, eyes wide and motionless, her hair forming a golden halo for the white oval of her face, the flame of life smothered to a fading ember. Would it not have been better if he had embalmed her, had killed her without knowing she lived? For was it not probable that a fate worse than death awaited her at the hands of Dr. Murray? With what sort of fiendish experiment did that madman of a surgeon intend to defile the body of this helpless woman?

Stewart did not know, could only wonder. His head drooped and a dark cloud brushed his brow, settled like a depthless black pool in his eyes. Three years ago he had entered into an agree-

ment with Dr. Murray, an agreement that he now regretted having made. But at that time, so long ago, the likelihood of his ever being called upon to fulfill his part of the contract had seemed very remote. Now that one chance in a million had materialized. He must deliver this living-dead girl to Dr. Murray, for what bellish experiment he knew not.

But he could not forget that Murray had made it possible for him to attend medical college, where he was now a fourth-year student. Quietly, without the public's knowledge, the surgeon had purchased this undertaking establishment, had put Stewart in charge so that he might earn the expenses of his education. In return, Dr. Murray had



*"And I say you shall not—it's murder!"*



placed one requirement upon him—he must ever be on the watch for the body of some person thought to be dead, a person in a state of catalepsy so closely resembling death as to escape detection in the hurried examination of some busy physician.

When and if such a body came to the undertaking house it was at once, and with great secrecy, to be turned over to Dr. Murray for use in some experiment the nature of which was as yet unknown to Stewart.

Well, here was that body, that living-dead human to be sacrificed in some horrible travesty of surgery. She must be given to Murray, for he—Stewart—had to discharge his obligation. But it was too late now to consider such things. How he hoped that she died before—

The sound of an automobile in the sheltered driveway of the funeral home roused him. He went to the door, pulled it open.

"Come in, Dr. Murray."

DR. BART MURRAY, foremost young surgeon among his contemporaries, the flush of subdued excitement high upon his face, an eager light in his eyes, entered.

"Where is she?" he asked quickly.

"On the table."

Murray strode rapidly past Stewart into the embalming room. He set two instrument cases on the floor and began a quick examination of the girl. Then he turned to Stewart, said:

"She is alive. Just barely living."

Stewart agreed, said: "Want her?"

"Want her?" Murray exclaimed. "I certainly do want her. She is just the subject I have needed for my experiment. Do you think it can be safely arranged?"

"I hope so," Stewart replied fervently. "She hasn't been identified. We keep unknown bodies thirty days and then bury them in potter's field. There's the thirty-day body of a woman to be

buried to-morrow." He indicated a plain wooden coffin across the room. "You take this girl, and I'll put the thirty-day body in her place. I'll record a fake burial as of to-morrow to take care of the shortage."

"That should work out splendidly," said Murray.

"Yes," Stewart muttered. "It should. I hope it does."

Dr. Murray glanced at him sharply, smiled, murmured: "Do not become excited, Stewart. This is all in the cause of science, you know."

The surgeon opened one of his cases, took out a hypodermic syringe to which was attached a long slender needle. He tapped the neck from a small glass ampoule and drew the amber fluid into the syringe. Then he inserted the needle between the girl's fifth and sixth ribs at a point just over the apex of the heart. Slowly, very slowly, he expelled the liquid from the syringe.

"This drug"—Murray spoke as if to himself—"is superior to adrenalin. When injected into the muscles of a heart where there is still a tremor, its stimulating and dilating effect is quicker and more lasting. The patient usually lives several hours longer, even regains consciousness in some instances."

He laid aside the instrument, listened with a sensitive diaphragm-type stethoscope. "The heart is picking up rapidly," he said. Next he produced a larger syringe already filled with a colorless liquid which he injected into a vein in the girl's left arm. "This will thin out and oxygenate the blood stream," he continued, "which has become sluggish and slightly coagulated, due to slow movement with little or no respiration. It will also produce a narcosis that will prevent her regaining consciousness until after I have finished—ah—with the experiment."

Stewart said: "She's not breathing, is she?"

"Not noticeably. But enough for the

present. She can easily live six hours in this condition."

"Are you ready to take her to your laboratory?" Stewart asked.

"Yes. How?"

"In the little ambulance. You take her on. I'm off duty at midnight. I'll drive your car over and get—"

"Excellent!" Murray broke in.

"Then you can observe the experiment."

WHEN Stewart arrived at Murray's laboratory, which was in the basement of the doctor's spacious home, he found the surgeon about to begin the operation.

The nameless girl had been placed on a wide operating table, the entire upper portion of her torso bared, both arms strapped rigidly to supports at her sides. There were glittering arrays of instruments in basins on small white tables. A battery of powerful electric lamps hung overhead. The room reeked with the odor of antiseptics.

Dr. Murray slid his hands into rubber gloves that his assistant, Mona Reece, a laboratory technician, held out for him. Both nodded as Stewart entered.

"You are just in time, Stewart," Murray said, flexing his long, tapered fingers. "Being a student of medicine and surgery, you will be interested in this operation. It has never before been attempted."

A hundred perplexing thoughts and questions swam through Stewart's mind, but he said nothing beyond a perfunctory greeting. His curiosity, he suddenly discovered, was mounting in spite of himself. Since the affair had progressed this far he might as well see it further along, distasteful as it no doubt would later prove to be. He'd see the start of the operation, anyway.

Murray took up a thin, long-bladed knife and laid back a large flap of flesh on the girl's left breast, while Mona Reece swiftly and expertly caught up the severed blood vessels and muscles.

Murray disarticulated the third, fourth, fifth, and sixth ribs at the breastbone, used bone scissors to cut them well back under the arm. He swung the entire section aside on its hinge of flesh and muscle.

"We are now entering the middle mediastinum cavity," Murray said in the manner of an anatomical lecturer, "by way of the pleura."

Stewart looked on as the surgeon, with a few deft strokes of the knife, cut through the pericardium, the sack that contains the heart, laying bare that throbbing, bluish-red organ.

"The diagnosis of myocarditis was correct," Murray observed. "See the inflamed condition of that muscle? Chronic myocarditis. Unusual in a person of her age."

At a signal from him Mona Reece affixed hemostatic clamps of peculiar nature about the pulmonary artery, superior and inferior vena cava, aorta, and the four pulmonary veins, placing them just under and to either side of the arch of aorta.

Dr. Murray stood back and viewed the heart's ineffective struggle against the blocked channels of its circulatory system. The impulses became weaker, less frequent, ceased. There was a single jerking motion, a sort of shudder, then stillness.

Stewart felt a hot wave of rage and resentment surge through his being, blood thundered in his ears, and he clinched his fingers convulsively. By what right did this maniac, this blood-thirsty madman who called himself a surgeon, wantonly sacrifice human life? What benefit could science possibly derive from this thing? There were cadavers in medical schools for the purpose of dissection and experiment. This was murder, nothing less.

He tried to voice his thoughts, choked, murmured only: "She's dead now."

Dr. Murray eyed the young medical

student speculatively, said: "Certainly, she is dead—but not for long, I hope. I could not perform this operation—this experiment, if you will—in the face of a moving blood stream," as you will shortly perceive. I know what is in your mind, Stewart. Forget it. Forget all that superstitious rot about meddling with forbidden things. I grant that some biological experiments appear brutal and inhuman; but how else may science learn save by experimentation?"

Stewart stood back against the wall, trembling, his breath coming fitfully. He wanted to believe in the sincerity of Dr. Murray, this surgeon whom he had come to revere; this man who had given him his own opportunity to study surgery, to become a doctor of medicine. But why had not Murray revealed the nature of his experiment beforehand?

Stewart leaned forward, rubbed his eyes in an effort to clear his distorted vision. Murray returned his attention to the gaping cavity in the girl's chest, searched out and severed the three cardiac nerves on either side of the heart, ligated the upper ends. With long curved scissors he sheared cleanly through the several veins and arteries at a point between the heart and the metallic clamps. He used small sponges to soak up the consequent slight flow of blood, finally lifted the heart from the pericardial sack and placed it on an instrument tray.

"Now you shall see!" the surgeon flung over his shoulder as he turned and stalked toward a far corner of the laboratory.

From a huge glass case he wheeled out a narrow, tablelike object on which there was a strange mechanical contrivance apparently constructed of platinum or silver. The machine consisted of piston rods, cylinders of varying lengths, small cogwheels, and two delicate electric motors. Eight flexible metal tubes of different sizes extended from the base of the apparatus. A con-

trol panel with indicators, variable knobs, and attendant wires, was mounted at the table edge.

Dr. Murray beamed. "My mechanical heart!" he said triumphantly. "With it I can make the dead live again!"

AS THE surgeon stood there in his crimson-spattered white robe, his cap and bloodstained rubber gloves, Stewart likened him to some torture-master of a long-forgotten age. Surely, the man was insane, had allowed his love for surgery to pervert his mind. No surgeon in his right mind—certainly not one of Murray's intelligence—would admit frankly that a machine of cold metal could possibly replace the heart in the human breast. It was sheer madness.

Stewart turned to Mona Reece, expecting from her an indication that she was aware of the doctor's mental condition. But there was no lack of concern or of dread upon her face. There was but a flush of pleasure, a sparkle in her eyes as she stared proudly first at Murray, then at his creation. In that moment Stewart knew that the little technician's old love for Dr. Murray had not died, despite the fact that Murray had never returned her affection.

"But, doctor——" Stewart began.

"I have spent ten years of my life in designing and constructing this machine," Murray said, oblivious of the interruption. "Many failures came my way, and despair laid a heavy hand upon me. Finally, after no end of labor and expense, I built this instrument up to a point beyond which I could not improve it. Then there remained nothing further to do but await an opportunity to put it to the test. My affiliation with you, Stewart, has provided me with an excellent subject for the experiment. I am indeed deeply grateful.

"I did not reveal the nature of the experiment because I feared you, an

embryonic physician, would not enter into the agreement with me—would not countenance the removal of the heart from a living person's body. Your present nervous condition clearly indicates your perturbation at what you have seen here to-night. You think me insane; but I am not."

Stewart could not command an adequate reply to the doctor's statement. For how did one reason with a maniac? He viewed Murray's machine curiously.

"It operates exactly in the manner of the human heart," Murray told him, "with the exception that there is no contracting or dilating motion. Small pumps of the jack type provide the impulses that circulate the blood. There are the same number of valves and chambers as in the heart. An electric-heating unit, automatic in action, maintains body temperature of the blood while in the pump. These little motors provide the propelling power."

"Suppose your current supply fails," Stewart observed.

"That contingency has been anticipated," Murray smiled. "Electricity is furnished by storage batteries. There are two banks, each of which will supply power for more than a month. A motor-generator set will be charging one bank while the other is in use. Should anything happen to the motor there is the other beside it to cut into the circuit."

Stewart said no more, moved closer as Murray and Mona Reece resumed their operation upon the still, white form on the table. Never before had the young medical student seen a cardiac operation, or, for that matter, one of any sort so skillfully performed. It was one thing to dissect the viscera of a cadaver that had been preserved for many months, quite another to witness the removal of the heart from a living person.

A living person? She was a very dead person now. Murdered! And he

was jointly liable with Murray and his assistant for her death. Electrocution was the punishment meted out to murderers in this State. Why had he allowed himself to be led so blindly into this? Why?

But his soul was that of a medical man, and his intense interest for the moment transcended his fear, his abhorrence for the surgical sin. He watched with bated breath as Bart Murray and the technician worked.

They mopped out the pericardial sack with antiseptic agents to prevent infection, and Murray connected two of the pipes from the mechanical heart to the stumps of the aorta and pulmonary artery, affixed purse-string sutures which he drew tight over the metal tubes. Clamps were then applied to prevent possible leakage of blood. Removing the hemostats from the vessels, Murray started the motor, ran it slowly, allowing the pump to pull blood out of the girl's body.

"This is to force air out of the pump," he explained to Stewart. "Now we shall attach the other pipes and draw off the remaining air through this little valve. Then our mechanical heart will be ready for the test."

Murray attached the remaining pipes to the vessel stumps in the same manner as he had the first two, made provision for their upward passage as he closed the pericardium and caught up the intercostal muscles. He articulated the ribs at the breastbone, allowing the eight metal pipes to pass between them in two rows of four each. When he had resected the bones where he had cut them, he sutured the flesh flap and adjusted several small drainage tubes.

Stewart had observed the efficient work of Mona Reece, had seen her pass the correct instrument to Murray at the exact second it was needed without his having to ask. Stewart wondered if she, too, was mentally unbalanced, or if the surgeon had played upon her love



for him to draw her into this—this plot.

Plot? Yes. Murder plot! That was what the courts would call it. First-degree murder. And the penalty was death. This poor girl could never be resuscitated by any metallic heart—

THE VOICE of Murray broke into his thoughts. "Quick, now, Mona!" the surgeon directed crisply. "Start the heater."

The snap of a switch and they watched the rapidly rising needle of a heat indicator. When that instrument showed the mechanical heart to be at body temperature, Murray turned up a rheostat, set the pump impulses at seventy-five per minute.

Stewart came up beside Murray and Reece, peered into their faces. Each wore an expression of tense expectancy, of anxiety. Murray's normally serene face was pale, streaked with red. Sweat stood out on his forehead. His fingers trembled slightly. Mona Reece stood motionless, her brows drawn sharply together, the silvered instrument in her hand forgotten.

Stewart swung his gaze to the girl on the table. Would she live again? Was it possible that this mechanical contrivance could bring back life to a person dead—murdered? But what was that? He gasped as the unmistakable color of life gradually spread over her face.

Murray sprang to her side, administered a stimulant to the respiratory system, applied artificial respiration.

The girl's throat swelled in a gentle cough. Her bosom now rose and fell steadily, unassisted by Murray. She was alive again. For her lungs had taken up their own work. After a moment her eyes came glassily open, cleared—and she stared about the laboratory in evident bewilderment.

Dr. Murray, his face crimson with victory, hands held high above his head,

stepped back in a reeling, drunken motion. "She lives!" he cried. "She lives! The experiment is a success. I have put life into a dead body."

And once again Stewart felt that river of searing fire course through his veins. "Yes," he snarled, "the experiment is a success. You have put life into a dead body. But what have you gained? What have you accomplished? Nothing! This poor girl is doomed to a living death, chained in that infernal machine of yours. She can't carry it and its power supply on her person—can't go about the life of a normal human. Had you thought of that? You are a fiend, Murray, a madman!"

The young medical student swung about in his rage, stalked out of the building, leaving Murray and Mona Reece to gap wordlessly after him.

MORE than a month passed before Stewart saw Dr. Murray again. During that time the young man's mind was harassed and tortured by thoughts of his own implication in the affair, by anxiety for the nameless girl's horrible plight. Had she lived or died? And if she was living, what provision had Murray made for her care? At last, bearing nothing from Murray, and his state of mind becoming unbearable, he determined to return to Murray's home and see for himself what the outcome of the operation had been.

Dr. Bart Murray was sitting in the little office adjoining his laboratory when Stewart arrived. There was a far-away look in the surgeon's eyes as he nodded briefly, motioned the medical student to a seat; but there was no air of animosity about him. Stewart stood somewhat in awe of the doctor in view of his own outburst on the night of the experiment.

It was fully five minutes before Murray spoke, and his words came in a low, subdued voice. "You are right, Stewart," he said slowly. "I did wrong in making the experiment. It would have

been better for Inez, and myself, if I had been unsuccessful and she had died."

"Inez?" Stewart asked.

"Yes. Inez Hartmann. That is the name of the girl you gave me. She has told me about herself."

"Then she is living?"

"Life of a sort," Murray replied. "She is parentless and had come to the city seeking employment. She did not know that she had a diseased heart. It has been very difficult for me to explain to her her situation. But now she understands fully. She knows she must live the life of an invalid, chained, as you so aptly said, to that metallic pump in there on the table. She has become dependant and once tried to commit suicide by breaking the mechanical heart. But I chanced to go into the room in time to save her. It is by my own hand that she lives this life which to her must be a horror, and I will see to it that she receives every possible care. I have given up my practice in order that I may always be near her."

Murray passed, and Stewart watched the play of emotion about the surgeon's drawn face.

"To make matters worse," Murray continued, softly clicking the case of a clinical thermometer against his desk top, "I have fallen blindly in love with her. She cannot return my affection because, as she puts it, she dare not think of love. For what woman, she demands of me, can allow herself to feel emotion with a heart of metal?"

Murray's bloodshot eyes stared through the window into the gathering darkness, then he turned and faced Stewart squarely. "As you perhaps know, Mona Reece has loved me for years, but I have never loved her in return. She is jealous of Inez and threatens to kill her. I am distraught with anxiety and grief."

Stewart got quietly to his feet and

slipped out of the office as Bart Murray's head dropped low over the glass top of the big mahogany desk.

IT WAS two weeks later, a matter of business pertaining to the undertaking establishment making it necessary, when Stewart went again to Dr. Murray's home. He used the side entrance and found the office deserted. A slight noise in the laboratory attracted his attention. He pushed open the swinging doors and recoiled with a sharp intake of breath, eyes widened with horror. Speechless he stood there, his hand gripping the brass knob of the door.

Dr. Murray, shrouded in a white robe, moved swiftly between two operating tables on each of which there lay the still form of a woman. An instrument glistened in his hand, and there were streaks of crimson across his bosom.

Stewart moved slowly toward the tables. He had recognized both of those women. One was Inez Hartmann, the girl upon whom Murray had performed the experiment with the mechanical little technician who had assisted with the operation.

A glance sufficed to inform Stewart that both were dead, dead in the true sense of the word. The mechanical heart had been disconnected from the channels of Inez Hartmann's circulatory system, and where the metallic pipes had entered her chest was now an open cavity. A thin stream of blood, slowly oozing from a small round hole in Mona Reece's right temple, stained the support beneath her head. Powder burns about the perforation indicated that she had died of a gunshot wound.

And who besides Murray could have had reason to kill her? Nobody. He had murdered her. Had she become overinsistent with her love pleas, or had he merely needed her body for another damnable experiment?

Fear and rage struggled for posses-

sion of Stewart's brain. He strode forward, fists clinched at his sides.

Murray raised his head, exclaimed: "Stewart! Jove, boy, I am glad to see you. You must help me with this operation."

Stewart stopped in his tracks, cried: "Murderer! You were not satisfied with what you did to Inez Hartmann. You had to murder Mona Reece for some other foul purpose. I won't help you, and I won't hold my tongue any longer. I am going to the police with the whole thing."

Murray sprang toward the young medical man. Stewart whirled and snatched a large amputating knife from an instrument tray. He lifted it high and charged toward the volatile, protesting Murray. The knife came down in a vicious arc, but Murray stepped aside. His strong fingers, gloved and gory, struck forward, closed about Stewart's wrist. The knife flew from the younger man's hand, sliced toward the floor, and lay like a quivering arrow, point buried in the hard wood.

"You young fool!" Murray cried. "I need you. You've got to help me."

"I won't!" Stewart retorted, his lips drawn back in a terrible grimace. "I won't have anything further to do with this ghastly business. Let them send me up for life for my part in it—hang me even. I don't care. I'd rather die than go through another——"

He wrenched himself free of Murray's furious grasp, wheeled and ran toward the door, the surgeon's pleading voice following him. He hurled himself at the door, jerked it open and collided with an elderly man just inside the office. He stepped back, recognized Dr. Raymond Cleghorne, honorary dean of the university medical school.

"Stewart! What is the matter, boy?" the dean said. "Come here." He was a very old man who had contributed greatly to the science of surgery.

Stewart fell back against the wall, his

voice babbling: "Dr. Murray! His mechanical heart—and now he's killed Mona Reece and is trying something even more horrible. I don't know what it is, but I'm going to the police with the whole story."

Dr. Cleghorne's gray, wrinkled eyes bored into Stewart's. He spoke slowly, and his words had a soothing effect upon Stewart's ragged nerves.

"Mona Reece shot herself, son," he said. "I saw her do it. She committed suicide because Murray did not love her and refused to marry her. He had not wronged her, I know. It is just another of those unfathomable, regrettable incidents of life. Murray is going to transfer her heart to the body of that poor unfortunate girl. He is trying to save that life. You and I are going to help him. Yes; you and I. My hands are not so strong, not as sure as they were once; but I am going to help him—and so are you."

Stewart gasped, his brain refusing for a moment to accept the truth, the evident truth, in Dr. Cleghorne's words. He remained silent.

The old dean continued: "Murray is not a crary man. Far from it. I have watched his work through all the years in which he sought to perfect his mechanical heart. But my feeble hands would not allow me to participate in an actual experiment upon a human body. To-night we must help him, Stewart; and I believe we can do it. We three, who must forever keep locked in our brains the secret—whether we are successful or not."

Stewart's wide eyes looked past Dr. Cleghorne. In the center of the laboratory was Murray, and there was pleading in the gesture of his hands, his face, his low uttered words.

Stewart, his heart racing madly, exclaimed: "Yes; I'll help!"

It wasn't murder. It was science, braving world censure. And he would

help with the delicate operation. He was a medical man.

Stewart and the white-haired old doctor walked with measured steps into the laboratory. Without a word Stewart took off his coat and vest, donned a surgeon's robe, shoved his hands into elbow-length rubbed gloves. After that the entire operation to him was a blur—a vague lifetime of passing instruments, of catching up and tying blood vessels and nerves, and of knotting countless sutures.

Then he was seated in a chair, breathless, exhausted, listening to Dr. Murray's shout of triumph:

"She lives again! This time with a true heart. And you two have made it possible."

THERE were graduating exercises at the university medical school one morning the following spring. James Stewart and Dr. Cleghorne were walking to-

ward the college grounds. As they passed a certain residence the old dean consulted his watch, said:

"We've time to stop by and see Murray and Miss Hartmann for a moment, Stewart. Shall we?"

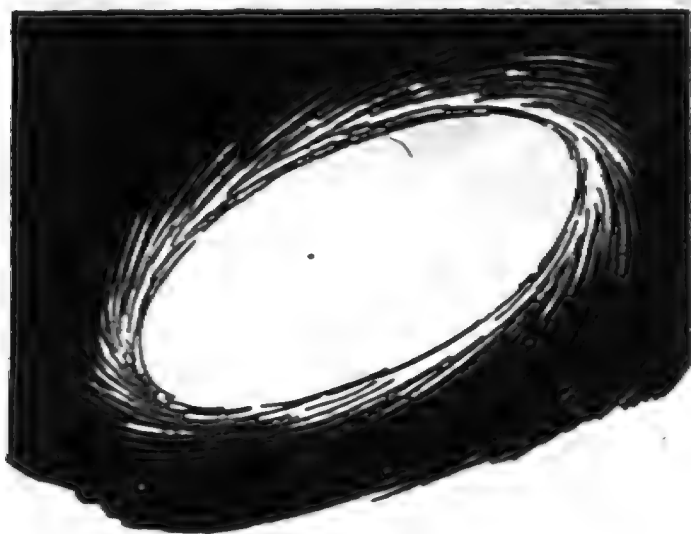
They entered a flower-sprinkled garden, saw Dr. Bart Murray rolling Inez Hartmann in a wheel chair. Murray greeted them profusely. He was radiant with joy.

"Inez has promised to become my wife," he told them, and glanced slyly at the girl.

Inez Hartmann gazed up at Murray. "What is the Latin term for true heart, Bart?" she asked. "I have been trying to think."

"*Cardiacs vera*," Murray replied.

Old Dr. Cleghorne caught Stewart's arm. "We must be going on, James," he said. "You are to be graduated this morning."







# Telepathic Piracy

*Illustrated  
by Elliott  
Dold, Jr.*

by Raymond Z. Gallun

**T**HERE rests to-day in the Smithsonian Institution a tiny mechanism which, ten years ago, in 1949, brought about a series of events that will be remembered as long as our civilization endures.

We look at the device, lying unob-

trusively in its glass case, with a kind of awed wonder. The most interesting piece of information concerning it is that it is not of Earth; it came to us from outer space, brought here by chance, embedded in a meteorite.

Its shape is that of a flattened rectan-

gle, an inch square and less than half an inch thick. It is made of a gleaming, silvery substance, harder than any material which we have yet learned to produce. In the exact middle of one of its sides is a blue crystal, polished off smoothly so that it is flush with the surface into which it is set. A malignant glitter shifts and plays deep in the heart of the crystal, giving a weird suggestion of evil.

We remember that in a sense the mechanism is evil, for through its marvelous powers nearly five thousand deaths were caused, and what was either a colossal threat or a colossal promise, depending on the point of view, was thrust upon the world. We remember also that the mechanism is benign, for it brought us the most useful scientific discovery of the age, at a time when it was most needed.

The fact that the device will no longer work as it was intended to has only enhanced the interest which it provided. Savants from many countries have probed the intricate maze of its inner-structure, without learning the secret of its function. No man of this planet ever really understood its principle.

It is the wreckage, doubtless, of some cosmic calamity that took place perhaps before this world existed. Where it was made, by whom, or what, are questions for which we can hardly hope to find specific answers. We can only feel a profound respect for the beings that produced it, wherever they might be, or have been, in an infinity of time and space. We cannot concern ourselves with that earlier history of the device, much though we might wish to do so.

Its career on Earth, however, in connection with Roland Voss, the man who is called the "Thought Pirate," is a matter of reasonably detailed record. Voss' diary sets forth most of the key events—except the final one, which we know through other sources—with complete clarity. Furthermore, we can trace from

its pages the workings of his mind and the trend of his not-altogether-depraved emotions.

Roland Voss has been described in many ways. He has been called a megalomaniac, a genius, an idealist of the highest type, a philanthropist, a fiend, and a fool. Maybe all of these characterizations of him are, in a measure, deserved. Perhaps in the last analysis he was only a man, caught up in a maelstrom of circumstances unduplicated in human history.

Physically he was a slight, unhandsome fellow, blond, and about thirty. His tendencies were studious and reclusive, and he had few practical contacts with the world beyond his chosen field, invention.

At the outset we find him, possessed of a small inherited fortune, at work in his isolated laboratory in southern Michigan. The second great business depression was already two years old, but Voss felt himself comfortably beyond its reach.

ON THE morning of February 15, 1949, an elderly farmer of the vicinity, named William Gales, came to see him. Gales brought with him a meteorite which he had seen fall on the previous evening.

The following excerpt from Voss' journal tells what took place:

"I was a trifle annoyed at first that the man should interrupt me when I was busy. Then he pointed out a bright metallic fragment projecting from the meteorite, suggesting that it might be platinum. I examined it carefully, though not with his hint in view. 'Its appearance is artificial,' I thought, 'almost like the corner of a tiny box.' The idea interested me. I did a very odd thing—one which may have had its origin in some theory which, subconsciously, I had already evolved. I held the meteorite against my ear, much as one might hold a watch to see whether

it is running. I thank Heaven now that I did so.

"In my entire life I have never encountered another phenomenon as surprising as the one I then experienced. Yet it came over me with such subtlety that I was not at once astonished; rather I was puzzled. William Gailles' appearance and possible character held some of my attention at the moment, I recall. I was trying to make an estimate of him. Gradually the realization dawned upon me that I was not examining just the exterior evidences of the man—his neat though shabby suit, his massive body, and his heavy kindly face; I was in fact looking into his mind.

"Not exactly in a visual way, of course; though I could see not only what his eyes beheld but I was able to hear sounds as his ears detected them, and was otherwise cognizant of whatever impressions his other senses registered in a manner that was only slightly less intense than the impressions which came to me from my own sensory faculties.

"I knew at once what William Gailles was thinking about and what emotions he was experiencing. I cannot quite describe the feeling. It was as though I had suddenly discovered that I possessed a sense, the vivid impressions of which I had never before experienced. Perhaps a person who has always been blind, and hence has no idea of what sight is really like, would grasp my meaning if vision was suddenly given to him.

"There William Gailles sat, visible to me through my own eyes; and there I sat, visible to myself through William Gailles' eyes. A fantastic paradox! The two images very curiously superimposed like some weird aberration of diplopia. And at the same time our thoughts and feelings were similarly superimposed, as though, mentally, we had become somehow merged.

"I caught Gailles' emotions. Hope was the most prominent of them, the hope

that the meteorite he had brought me for inspection might be worth money and that I might buy it. Mingled with this feeling, Gailles was experiencing the layman's awed curiosity at his find, brought about by the fact that it had come from a certain incredible region of vast emptiness and cold, concerning which he had never before pondered.

"The idea made him feel religious, yet a curious bit of course entirely natural and human cupidity was also detectable in his mental processes. He was here to drive a reasonable bargain; though, because of his inexperience in matters concerning cosmic phenomena, he considered himself somewhat at my mercy. If I should buy his find, he intended to use the proceeds as part payment for medical attention received by his wife.

"The processes going on meanwhile inside my own head were certainly of a far more tense and excited nature than those passing through William Gailles' brain. How I avoided betraying my surprise at the remarkable discovery I had made may be explained only by the fact that the gradual and subtle approach of my new powers gave me a moment to gain control of myself before full realization of their significance dawned upon me. Then I knew what they meant, or at least I had a theory.

"I could read my visitor's mind. Why? The meteorite, or something concealed within it, being held close to my brain, must be responsible, since there was no other explanation of the riddle. What was that something? An instrument capable of capturing mental waves out of the ether and amplifying them so that dull human brain cells could interpret their meaning? It seemed so. I knew that telepathy has gained considerable credence in the opinions of many authorities, their belief being substantiated by more or less convincing tests.

"The hypothesis on which they base their claim, is simple: It maintains that any thought or emotion which a person

experiences causes his brain cells to transmit vibrations into space—vibrations which are so modulated that they can, granting their sufficient strength, set up similar emotions and thoughts in another brain, miles, or even thousands of miles distant, when they impinge upon it. The transmission of radio impulses from one aerial to another is a perfect analogy of the phenomenon as it is generally conceived.

"And now I had indisputable proof, at least of the existence of telepathy, if I was to credit the evidence of my own faculties. The machine, the instrument that made the marvel possible, was here in my hand, embedded in a meteorite. Gailles was unwittingly trying to sell me a priceless invention produced by unknown and perhaps long-extinct denizens of some region of the interstellar void. That he did not know of its powers was evident.

"I knew from his thoughts that I could purchase the meteorite from him for very little. I did not wish to be unfair, particularly because of his wife, whom he loved very dearly; but to offer him a large figure might have been fatal. He might have suspected the true value of his find and have demanded a higher price than I could pay. Then the meteorite would have gone to some one else. To let this godsend slip through my fingers was something I could not tolerate.

"I had held the object close to my ear for only a moment. Now I lowered it and began to toy idly with it.

"'Meteorites aren't generally worth much,' I told Gailles depreciatingly. 'That silvery stuff may be partly platinum, but it isn't pure, and there isn't a lot of it there. This meteorite would look well in my collection, however. If you care to sell, I'll give you a hundred dollars for it.'

"His eyes popped with pleasure at that. Though I could no longer read his thoughts with the meteorite away

from my head, I knew he hadn't expected to receive even that much. There was no haggling. He accepted my terms without question. Soon I shall find a way to benefit him with at least some of the money he deserves, for I am deeply grateful to him. Maybe the benefit will take the form of an inheritance from a forgotten relative. Who knows?

"I have experimented with Wodin, my dog. I have cut the telepathon, as I call it, from the lump of metal in which it was encased. But of that later. I am very tired now. I must sleep."

THUS Roland Voss recorded the beginning of events. His words were a trifle pedantic, perhaps, and smug. There was in him a jealous urge to acquire knowledge, which permitted no sharing of his opportunities with others. Is this to be condemned? Possibly. Though it is a trait common enough among individuals who spend long periods of time engaged in solitary research.

For three days Voss remained secluded in the big farmhouse which served him as a laboratory, busy probing the possibilities of his new toy. As yet, that was his only motive. He was tremendously fascinated by the telepathon, and with the usual zeal of the experimenter he was determined to find out as soon as possible, just what it was able to do. As already indicated, his police dog, Wodin, was his first subject.

"Directly after Gailles had left," he wrote, "I tried the properties of this remarkable bit of cosmic flotsam on Wodin, for I was too impatient to attempt the tedious task of freeing the telepathon from the meteorite yet.

"I held the object to my head, just about as I had done when Gailles was here, and looked down at Wodin where he lay sprawled on the floor. Nothing happened until I caused myself to wonder what the old reprobate was thinking about. What followed was almost a repetition of the odd sensations I ex-



perceived while reading Gail's mind. I could feel Wodin's contentment almost as tangibly as if it was my own. I could receive all his sensory impressions.

"The room looked quite normal through his eyes, except that very near objects were blurred, and colors were not as distinctly defined, somehow. I was conscious of numerous odors, many of which were out of my experience; most of them were pleasant, but a few were not, among them that of tobacco smoke. Wodin's keen sense of smell is offended by my cigarettes, though he seems to like me well enough otherwise. His hearing, too, is extremely sharp; the ticking of my watch was plainly audible, as were certain whispering, rubbing noises which I did not identify at once, since they were too slight to be detected by human ears. They were sounds produced out-of-doors by the ghost of a breeze that was blowing through the treetops.

"As for Wodin's thoughts, he was wondering foxily whether my intent gaze indicated that he was about to receive a scolding of some sort, though he was not worried about the possibility. There seems to be little difference between the human and the canine mind, except in degree. Wodin's intellect must be about the same as that of a small child."

After investigating the dog's mental processes, Roland Voss cut and chiseled the meteorite away from the telepathon. He examined the latter as well as he was able from the outside; but finding no aperture through which to investigate its inner structure, and fearing that he might injure some vital part if he attempted to cut through the case, he desisted. Nor has he left any further indication that he ever again tried to learn its principle.

He returned his attention to the study of telepathic phenomena, this time more ambitiously, however. He wanted to see whether the telepathon worked at a

distance, and he was quick to discover that it did.

"I had only to wonder what any certain person in the neighborhood was thinking about, to know," he explains. "Apparently the device not only receives telepathic impressions, but is tuned to resonance with any brain by thought waves originating from the operator. Efficient, convenient; perfectly so."

In this way he learned that his purchase of the meteorite from Gail's had aroused considerable interest among the people of the countryside around him. In consequence he felt it better to leave the vicinity to avoid any possible complications that might arise through gossip. And so he closed his laboratory and departed, establishing himself in a quiet locality in the Southwest. There was nothing in his exodus to provoke any deep wonder, for he frequently indulged in similar sudden and unexplained absences.

Concerning his erstwhile neighbors, Voss leaves us a brief comment which foreshadows his later decisions: "These times have not been kind to many of them."

The next thing he did was to arrange the transfer of a five-thousand-dollar "inheritance" to William Gail's. Then, feeling secure in his new location, he continued with his experiments with the telepathon. He directed his thoughts to various famous men, savants, statesmen, inventors, capitalists, and so forth, who were scattered throughout the world. His efforts to penetrate their thoughts were completely successful, as his journal records:

"DISTANCE has very little effect on the strength of the impressions I receive," he wrote. "Frederick Mollison, President of the United States, was an open book to me. So was Sanders, the inventor, and Jarow, the physicist of Breslau, Germany, and Meredith of London, and all the others.

"President Mollison is honest and tired; tired I was sure he must be, and I am greatly gratified to find that he is honest, if somewhat lost in the magnitude of his task, now that so many people are in distress. He is beset by many plans and theories for the betterment of industrial conditions; but there is so much conflict and opposition among lesser officials and among the populace, that his capacity for betterment is limited. It is much the same with the English prime minister, and others in high places.

Several of the dictators of continental Europe have felt too strongly the selfish urge to increase their power. Power is their food. The same is true of quite a number of the politicians of the United States. It is indeed a fact that the telepathon gives a cross section of life, and of human nature, its virtues and its vices.

"Sanders is too deeply buried in his inventions to bother with power as a statesman would understand it. He is designing a pneumatic tube through which he is certain it will be possible to drive a passenger car from New York to Los Angeles in an hour and a half. The project, however, is costly, and he is worried. Jarow of Breslau is, as usual, almost living within the atom, in quest of its secrets. Transmutation of elements is his greatest passion.

"Carrel, the American 'Gadget King,' has worked out in his mind an ingenious little apparatus for tuning radio-vision sets. It is quite simple, but should be worth millions, even now. Incidentally, Carrel has very peculiar eyes. To him the spectrum is inverted. He sees violet as other people see red, blue as others see orange, and the sensations of yellow and green are also transposed. Something is wrong with the light-interpretive vision centers of his brain, doubtless. The world looks very different to him from what it does to his fellows, and queerly he not only does not

suspect it but has no means of suspecting it.

"What a wonderful device the telepathon would be for a spy, a black-mailer, or for one who desired to steal the ideas of others! I could very easily beat Carrel to the patent office with his radio-vision invention and reap a rich reward. And there are half a hundred other inventions of worth that I might pirate just as readily. But I have no intention of doing this."

Roland Voss, you see, was evidently quite sure of his ability to withstand temptation when he penned those lines. However, within a week, circumstances arose which changed his perspective of affairs considerably.

His restless proings with the telepathon continued, and he was brought into vivid contact with facts which he had naturally known were true, but which, since they had previously come to him only through the lifeless channels of newspaper columns and radio reports, he had never before actually realized.

Human suffering—it was inevitable that the fact of its existence should be brought home to Roland Voss more forcibly than to any person before him. The waves of it came to him from millions of human minds everywhere. Not physical suffering alone, but the poignant mental suffering of poverty, of broken self-respect, of resentment, and of strangled energies.

Voss recorded his reactions thus:

"If I had been forced to watch a small child being slowly cut to bits, I could not have been more deeply moved. I cannot sleep. I am like a madman. The feelings of those people were like personal experiences. It may be wrong to steal Carrel's gadget, and the inventions of those other men; but I cannot avoid it now. All I know is that I must have money to help."

Roland Voss pirated Carrel's radio-vision device, taking most of the needed information from his victim's mind,

though it is to his credit that he worked out certain minor details himself. And his guess as to the value of the invention proved true. Within a short time fat royalties were pouring in, only to be parceled out to needy and worthy individuals in all parts of the United States. For discovering such persons, the telepathon proved to be all that was necessary.

Other thefts of a similar nature followed in rapid succession, small inventions mostly, adaptable to the none-too-good industrial conditions; cheap to produce and quick to bring lucrative returns—a new wood-pulp fabric, an improved automatic pilot for aircraft, a cheap rubberlike surfacing for pavements, and numerous others.

The victims of his piracies felt chagrined, no doubt; yet they had not the faintest inkling of what was really taking place. Roland Voss remained strictly in the background, acting the part of the strangest Robin Hood of history. He stole only inventive ideas, thus remaining within his own field, not expanding his activities to the limit of the opportunity which the telepathon offered him for criminal gain. Maybe this was because he felt an inadequacy of experience in other directions.

HOWEVER, it was not long before he saw how small a measure of benefit his philanthropies achieved.

"It is like pouring a few buckets of water into the ocean," he commented despairingly. "Giving to those who need is not a cure for world troubles, anyway; it is only an easing drag."

"In every human life I suppose there must be a certain amount of pain and grief, perhaps beneficial in the end; but the difficulties brought about by the present breakdown, or clogging, of the economic machine—they are maddeningly ridiculous. In America, at least, we have the means to give every man, woman, and child every comfort and

luxury that science can offer. Then why is it not done, as long as people are eager to work?"

"Why is there so much talk and planning and wrangling, so much conflict, so much thought of self, so much insincerity checkmating sincerity, even among those who suffer most? These times will pass, of course, as others have passed before them; but in the future more will come—needlessly."

"I do not profess to have a solution, yet I am sure that one exists, if there was a way to put down all this opposition long enough to find it. If there was a man possessing sufficient character to put aside selfishness, and with the power to compel his fellows to absolute obedience, I believe the problem could be conquered with a minimum of bungling. Then, when the way had been shown, and the people convinced, he could relinquish his despotic control and democracy could be restored."

Such was the idea which formed the pivot of Roland Voss' later activities. Possession of the omniscient telepathon, which could give him intimate knowledge of any person on Earth, soon forced its inevitable suggestion of dominance upon him.

"How do I know that I am not meant to be a man of destiny?" is the way he expressed it in his journal.

The cat was out of the bag, so to speak. Still continuing his mind piracies and his philanthropies, Voss began to visualize himself as a benevolent despot, guiding the world on to better things. He began at once to lay plans for the realization of his dream, though as yet he was by no means sure of his ground.

Overthrowing the established system of any country is obviously a tremendous task, unless discontent has shaken the system to the core. Voss was not a politician, and he could not use the weapons of a politician, even if there

was a likely chance for success in that direction. He did not wish to rely on the questionable loyalty of human aids. What he wanted was a weapon of such enormous destructive action that by using the threat of it, he could, single-handed, command the world and chastise it to obedience if necessary.

And so he attached his hopes to a distant star—atomic energy, the chained giant that seemed forever bound. The unsolved mystery of it seemed to promise him the one weapon that would be sufficiently powerful for his ends.

Forthwith he went hunting for its secrets, armed with the telepathon. Many scientists were working on the problem, but with little success. A few of them had learned much, but not enough to realize their goal.

"There is little hope for any immediate results," Voss recorded. "But if it takes the rest of my life, I intend to go on. One idea interests me. A youth of nineteen who lives in Vermont, and who is in love with a very pretty girl, is among several who entertain it. Briefly it is to duplicate the conditions which exist in the interior of the Sun, since it is certain that atomic energy is being released there. Yet how could the countless tons of pressure, and the terrific heat extending doubtless into millions of degrees, be produced on Earth? No; I am afraid that the notion is impractical."

AND THEN came the beautiful evening which proved propitious. Roland Voss went out on the veranda for a breath of air.

"I could see the moon shining on the hills," he wrote. "The scene was very beautiful, the quiet heavy. I touched the telepathon to my head, at the same time thinking of atomic energy—it had become almost habit now. And lo! Vague, tantalizing shapes swarmed into my brain. I struggled with them, try-

ing to bring them out clearly, succeeding a little, but not enough.

"I shut my eyes; that helped, but again not enough for complete understanding. The end of my quest is in this vision—that much I could gather. I could make out vast, glittering machine-forms crowded together in a cavern that seemed without limit. A beautiful light of a hue which I had never before seen suffused the place like a phosphorescent mist. Creatures moved about busily—things of nightmarish aspect, with warty flesh and long, undulating bodies fitted with stabby, tactile appendages.

"Where was this place? Without surprise I received the answer. It was on another world where the problem of converting matter into energy has been solved. The Moon—some buried grotto of colossal dimensions. I could see buildings, or, rather, fabrications that here passed as buildings, and grotesque fungus growths that reared knobby heads high in the air. Unconsciously I had thought of the Moon, and that was why this dream had come. It was dim because our satellite was nearly a quarter million miles away, almost beyond the range of the telepathon.

"I was receiving mental impressions from a weird Selenite monstrosity of great learning—new gorgeous colors, invisible to human eyes, and never seen by a man before, the colors of heat rays, perhaps; and the answer to the riddle of atomic power was forming in his brain. Terrific heat and vast pressure such as exist in the heart of the Sun, of which he knew nothing, since he had always been here in this sub lunar cavern. Then that impractical notion is practical after all. The heat and pressure were brought about by—I could not capture the rest, though I kept at it for hours.

"Then, when I was very tired with the effort, an inspiration came. I would sleep with the telepathon under my head.



With all the usual distractions of waking life blotted out, my mind should be more receptive. And so I did this, with the window open and the Moon shining on my bed. I am succeeding slowly. It is difficult to reconstruct the impressions of a dream; it can be done only bit by bit. To-night I shall make another attempt—"

There follows in Voss' diary, an imposing array of mathematical formulae, painfully pieced together. His unique interplanetary mind-piracy was doubtless aided very much by a real analytical brilliance of his own. To-day the principles by which intra-atomic power is released are understood sketchily by almost every one. Pressure—that is the most important factor—pressure enough literally to crush matter so that the structure of its atoms collapses. It is achieved not by mechanical means, since nothing of even the strongest metal known could withstand the strain; it is achieved rather by a glowing shell of pure force that is produced by the warping of space itself, and involves in some way the as yet but dimly understood enigma of gravity.

The force shell is made to contract around the material to be disintegrated. The building up of pressure on the substance creates tremendous heat which aids in the process. As a result, what is really a small sun is brought into being, which throws off vast quantities of radiant and electrical energy, duplicating on a small scale the central furnace of the solar system.

After his solution of the mystery, Roland Voss found little time to make further entries in his diary. Yet we can well believe that he was working now with a feverish fury which few men could have equaled. A few hastily scrawled words show that he was searching for methods of applying the titanic forces now at his command. And again, through the telepathon, the Selenites

proved able teachers. His chance was coming years ahead of his expectations.

WITH his objective now clearly in sight, Voss drew up blue prints for a craft such as had never yet flown the skies of Earth. Judiciously, to avoid unwelcome attention, he had most of the parts manufactured by various firms scattered throughout the country. And those elements which were most novel and vital—the armor plate of a nearly impierceable lunar alloy, the propulsive mechanisms, and the dreadful weapon he intended to use—be contrived to make himself. The assembling, too, he accomplished alone.

"Thank Heaven, the job is done!" he commented gratefully in an entry dated September 12, 1949. "The *New Era* is finished. Now I can face the nations alone, with a considerable chance of success. There will be some death and destruction, I suppose, but I cannot help it. It seems that only thus can the ills of civilization be cured for all time." I feel, somehow, like a god. Can any man ever avoid the brutalizing touch that power gives him? I shall not weaken or—"

On September 15th, just seven months after William Gailes had brought him the meteor, Roland Voss' colossal threat or promise burst upon the world in the form of a short radio speech obviously broadcast from a very powerful station, though he did not permit his face to be seen in the vision plates.

"To-day is the beginning of the end for the existing economic systems of this planet," he announced. "They are outworn and rotten; they must pass to give way to a better condition in which want, and other forms of human suffering that are needless, will not be tolerated. The thing that is most necessary to show the way out of these ills is a man with the power to guide the energies of his fellows into channels that are useful to themselves and to others.

"Since I believe I have this power, I intend to take control for a while, until I have proved that things can be made permanently better. What I shall do is dictated only by a spirit of helpfulness and not by a selfish desire for personal aggrandizement. My name need not be known for the present; I shall be recognized easily enough when the proper moment arrives. I request, therefore, that as an initial move, the United States government prepare to receive my absolute control. The other nations will follow.

"I shall know whether my plan has been rejected or approved, without any communications. If it is rejected, I am prepared to use force, which I am sure will be an effective persuasion. A little blood may need to be spilled; for this I am very sorry. But I hope for cooperation, my friends, so that when the time comes to release my mild yoke, we shall be able to rejoice over our achievements. That is all I have to say now."

Those are Roland Voss' words, as recorded in history. Whatever flaws his great dream was marred by, one thing is almost certain—he was sincere; he believed in his theories.

Hiding with the *New Era* in a cavern which he had blasted out of the Arizona desert the day before, Voss probed the minds of the world with the telepathon. What he discovered was not particularly encouraging. A few downtrodden people had received his message with faint hope, a few more were angry; but the vast majority considered him an object for hilarious ridicule. He was some crazy crank, a fool, a nitwit! Small credence was attached to his promise of violence.

Roland Voss felt suddenly very depressed, as though the emotions of those who laughed at him were exerting a tangible influence upon his spirits. "There is but one course to follow now," his diary recorded. "I hope that I need not be too harsh."

AT DAWN on September 17th, the *New Era* left its place of concealment and tore shrieking through the atmosphere toward the northeast, blue fire sparking from the propulsion rods at its stern. It was a little thing, barely twenty-five feet in length, rakish in form, streamlined for the terrific speeds it could attain. Stubby airfoils projected from its body, which glistened elusively in the Sun.

The craft slowed up over Chicago and circled, while in a short radio message, Voss, its pilot, announced his intention to show what he could do. No resistance was offered him, for no preparation had been made.

From three points on the hull of the *New Era* streams of incandescence flashed downward. By intention they struck beyond the limits of the city, where the danger that they would cause loss of life was smallest. Yet the havoc they created in the bare countryside was eloquent of their capacity to inflict destruction. Vast clouds of superheated dust boiled up from where the beams struck, and smoking scars were gouged in the earth, as if some cosmic giant had left its mark there, which in a way was true.

Then the *New Era* climbed up into the sky, out of sight. A few minutes later it arrived over New York. An air force permanently stationed there, having been warned, was ready to meet it. The encounter which took place high in the stratosphere was quickly over. Almost without effort Voss blasted the planes from the sky. He continued for a short distance out over the Atlantic to meet a battleship that was approaching. Immune from attack himself, he directed his white-hot beams toward it. It burst apart amidships and sank like a stone, leaving only a cloud of steam and smoke over the spot where it had disappeared.

Voss turned north, and landed his flier on a hillside in an out-of-way locality in Maine. It can be presumed that

he wanted a little leisure in which to investigate with the telepathon the reactions of the world to his demonstration.

Within an hour the *New Era* was found, still at rest on the hillside, by a group of State police which inhabitants of the vicinity had notified. Warily they approached the craft, while a cursing mob in the background urged them on. It took nerve to advance upon that slender wasp of death and pry its doors open; but it was done without incident.

Behind the controls they found Roland Voss, sprawled amid a maze of strange instruments, his body already becoming cold. He was dead. Beside him, close to his outstretched hand, lay the telepathon. There was no mark of injury anywhere upon him. His diary was in a pocket of his coat.

How had Voss met his end? No explanation was known at the time; yet within several weeks, when the story of his career as the Thought Pirate was learned and analyzed, a theory which is now recognized as fact was evolved.

WHEN the blasts from Voss' flier tore the ground at the outskirts of Chicago, destroyed the fleet of planes over New York, and sent the battleship to the bottom of the ocean, the news of his exploit had spread like wildfire. It aroused fear; but because courage is the cheapest and greatest virtue of the human race, and freedom ode of the most valued possessions, it aroused far more anger—black murderous anger.

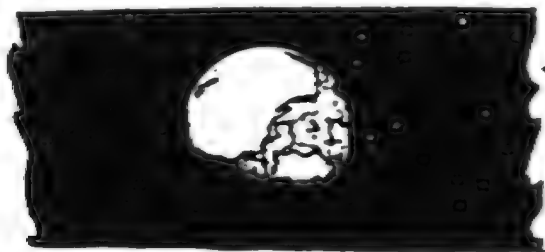
And the telepathon which had aided Voss so much, at the last proved his undoing. It tapped that tremendous store of hate originating from many hundreds of millions of human minds and poured it, in a killing wave, into his brain.

Roland Voss died the strangest death that has ever happened on Earth. His telepathon, too, ceased its marvelous functions—overloaded, burned out.

His dream had found an unexpected grave. But the craft he had made remained for investigation and study, offering fresh and useful wonders to mankind. The *New Era* has been at once a prophecy and a fulfillment. Interest and enthusiasm, the most potent of human emotions, have been reawakened. Limitless atomic power has been poured into the veins of industry and commerce, giving them new life. Soon they shall extend their long arms into space, whence the chain of circumstance had its origin. Truly a new era has come. The era of hate is over.

The world is still imperfect, but it has improved. The conflicts that form the chain of human life still go on, as perhaps they must. Perhaps there is no ideal condition.

The telepathon, which came from no one knows where, still rests in its glass case in the Smithsonian Institution, as no doubt it will for thousands of years to come. It reminds us of the past and of Roland Voss. Perhaps he was truly a man of destiny after all.



# Accelerating

*This time again I have a lot to say. Brass Tacks is an excellent example of why I prefer not to comment on your letters. I don't want to steal the last word. Van Campen has stirred up a hornet's nest. I hope he is good on the defense. It looks as if we'd have the air filled with mathematical equations for a time.*

*Next month we have lined up what promises to be the best issue to date of the new Astounding. The schedule is not yet complete but it includes up to now C. C. Campbell, Stanley Weinbaum, Harry Bates, Stanton Coblenz, Earl Vincent, Donald Wandrei, John W. Campbell, Jr., and our new find, J. George Frederick!*

*It looks as if it may be our first "all-star" issue, with a whale of a good thought-variant leading the parade. And I think that is real acceleration, don't you?*

*And another thing. I'm answering your letters as rapidly as I find time. Please don't think you've been neglected if I'm slow. I have to sort of mull them over and get a combined impression in order to carry on the development we've worked out together.*

*You see, one letter says a thing one way, the next says the same thing a different way. So by the time I've read 100 or more I begin to lay a pattern for the future. Each month this pattern changes a little. That is why we are keeping clear of monotony.*

*We've gathered our favorite authors inside our covers, and we've added new names to our galaxy as rapidly as they have proved their worthiness.*

*Glance back some day at the October 1933 issue, then look at January 1934, then January 1935, and then compare any one of them to this issue. And then compare this issue with April when you get it. You'll be surprised at the steady climb if you'll really take the trouble.*

*And we're still climbing. Is it reasonable in view of the climb to ask those of you who haven't found a new buyer for Astounding to do it now? I've got plans in the cubby-hole just waiting for that one last little boost before I can afford to put them in motion. And you know, I only ask you because our reading circle is different from that of ordinary magazines. Your interests and mine are the same, but only through you can I reach out to your friends. Will you do it? Thank you.*

—The Editor.



# Let's Get Down to BRASS TACKS



AN OPEN FORUM OF CONTROVERSIAL OPINION

## The Shock Troops Attack!

Dear Editor:

The *Irreversible* is a remarkable science-fiction story, one that deserves preservation in the Hall of Fame of science-fiction. Indeed, it is an unusual and rare piece of science-fiction, judging it by the truth that now fills the three magazines that compose this field. The *Irreversible* is also trash, of course, but derives its noteworthiness from a most extraordinary quality, rarely found in modern science-fiction; to wit: it has a few correct scientific facts in it!

The author has compensated for this by having much that is incorrect.

It is to be hoped that no story will ever appear with all its statements of scientific facts and theories correct. The shock would undoubtedly kill all the authors, editors, artists, readers and advertisers connected with the field of science-fiction.

And wouldn't that be a pity?

No.

To return to the story under discussion, I'd like to ask Mr. Karl van Campen where he gets the nerve to make so deliberate a misstatement as that which comprises the first clause of the first sentence on page 49 of the December, 1934, issue of *Amazing Stories*.

"You can correctly say that an automobile is going 300 miles per hour."

Full stop, Mr. van Campen, you canNOT say anything of the sort correctly.

Imagine a straight road parallel to a straight track. On the road runs an auto and on the track a train, both going at 300 miles per hour and in the same direction. What is the speed of the auto? The question is meaningless; for you say its speed is 300 m.p.h. I say the speed is zero. We argue from now until Doomsday on which happy occasion Gabriel, between bouts on his trumpet, informs us that we're a pair of idiots because you were measuring velocity relative to the ground beneath the auto, I was measuring it relative to the train, and we were both correct. So what?

Well, we measure velocity on earth with respect to the ground only for convenience. When it is said that an automobile has a velocity of 300 m.p.h. it is tacitly assumed that this velocity is relative to the ground. We could measure an auto's velocity relative to an asteroid in a

pond in the garden of Dethall, the great Martian science-fiction editor, but it wouldn't be so very convenient, would it? No, but it would be just as correct.

So, there's a bald error.

The proposed method of generating electricity by having rocket ships sailivant around in space with coils is just plain stupid. Electricity would be generated, but why go off ten or twenty or a hundred thousand miles into space where the earth's field is weak compared to what it is at the surface of the earth?

Consider the figures: At the surface of the earth, 4000 miles from the center, the magnetic field strength is some quantity  $H$ . Magnetic field strength falls off inversely as the square of the distance from the source. Hence if a rocket ship were 20,000 miles from the earth's surface, the field strength at the rocket ship would be  $1/25$  of what it is at the earth's surface, because the distance from the source (earth's center) had increased five times (20,000 equals 5 x 4000) and therefore the field strength must have fallen off inversely as the square of five.

Now at 20,000 miles from earth's surface, the gravitational pull is also  $1/25$  of its value on the surface. Hence the maximum orbital velocity a space ship could have around the earth (at that distance), without flying off into space due to centrifugal force, is then  $1/5$  of the velocity required to keep the same ship in an orbit around the earth at the earth's surface. At a distance of 40,000 miles from earth's surface, gravity is reduced to  $1/100$  of its value at the surface and correspondingly, the orbital velocity of a space ship around the earth could not exceed  $1/100$  of what it would be at the earth's surface.

So it is seen that the farther out the space ship goes, the weaker is earth's magnetic field and the slower the ship would be forced to move through that field. From either one of these causes and more noticeably from both together, the electric energy generated as the author proposed would fall off very rapidly as the space ship went out further from earth.

The most efficient plan would be to get as close as possible to earth, where the field is stronger and the orbital velocity around earth must be greater, both factors increasing output of energy. Omitting the possibility of getting a

still stronger magnetic field by going down into the ground, the maximum electric energy is to be had by staying right on ground old Mother Earth and whisking the coils at high speeds. Higher, much higher, than the speed they would have set in a space ship in an orbit around earth.

Why isn't that method used right now? Because it doesn't produce enough electric energy to pay for the oil needed for lubrication. Earth's magnetic field is NOT large at all, even at the surface of the earth.

Consider the huge numbers this Van Campen person throws around so calmly toward the red. "Well, the ship was traveling 15,000 m.p.h. relative to the more distant nebulae . . . and so at the same time, these same molecules of gas were doing work at the rate of . . . that's 15,000,000 ft.-lb. of work."

If that vast amount of energy exists because the ship was traveling 15,000 miles per second relative to the distant nebulae, then that energy exists only RELATIVE TO THOSE NEBULAE, and that energy cannot possibly exist relative to earth because the ship was not traveling 15,000 miles per second relative to earth. That energy could be utilized only in the space-to-nebula system, and not in the earth-space ship system, as the author proposed.

Then, too, are the nebulae running away so fast? The shift to the red in their spectra may not be due to the Doppler effect, but to other causes. After all, we know nothing of the physical conditions between here and the nebulae, so that the hypothesis (this hasn't even the status of a theory) that the nebulae are running away is only one of many possible interpretations of the shift to the red.

Even granting everything Van Campen said to be true, he still did not disprove the law of the conservation of energy. With a very small expenditure of energy I can set fire to a forest and get enough energy to send a hundred steamships around the world. Is that a violation of the principle of conservation of energy? May, say, as the horse would remark.

And the principle could not be disproved by idle chatter and speculation. This is not the middle ages when a thing was proved by reference to a book written a thousand years before. Only an actual physical experiment could disprove the principle.

In short, Mr. van Campen, for not using your knowledge and training to write real science fiction; for doing what all other authors do and what has made science-fiction the obscure, stupid, cheap literature it is to-day; and for writing *The Invention* which caused me to break once and for all with science-fiction; for all that, Mr. van Campen, says to you, "Tut-tut," Milton Kalitzky, 1221 University Avenue, New York City.

## The Defense is Ready!

Dear Editor:

Mr. Kalitzky's letter reached me this afternoon. It seems to me an unbecomingly vigorous mass of inaccurately assembled data beginning blamingly in truth, but largely blamingly into the air rather than accomplishing anything. I really can't answer his objections, because he doesn't make any reasoned, logical argument. His sole point seems to be an objection to my statement that an automobile's velocity can be measured as a rocket ship's cast. Then he does have some material about the proposed method of generating electricity, which was, of course, simply an interesting though admittedly somewhat impractical method. However, his calculations are a bit wrong there. I suggested the ship should circle at some distance from the Earth simply because of atmospheric resistance at the surface. As Mr. Kalitzky proposes, it would be more advantageous, of course, to operate at the surface, but that atmospheric friction makes that so inefficient.

Anyway, his use of the elimination of gravity and magnetic factors is confused, as he suggests, particularly in his consideration of orbital

velocity at increasing distances, to take into consideration the fact that centrifugal force at a given velocity falls off as the radius of the orbit increases, so that his 1/2 and 1/100 factors are wrong, though as that is unimportant anyway, I haven't calculated exactly how wrong.

But as I said, they are in discussion only of a minor "reader" idea supporting the important basic principle of the irreversibility of the rocket. If his falling off of orbital velocity with distance were correct, the Moon, at 230,000 odd miles would have an orbital velocity of 230,000 divided by 4,000 squared—that is (230,000/4,000)<sup>2</sup>—and divided into 6 (the orbital speed at Earth's surface) which would be one thirty-six hundredth of 61, or one six hundredth of a mile per second. In fact, the tables give it as about 1,550 feet per second as against the eight feet per second according to Mr. Kalitzky's diagram.

Evidently Mr. Kalitzky wasn't able to see my point, however, in questioning the automobile and its velocity. The velocity can be measured, even if it is going alongside the 200-mile-a-hour train, because the automobile isn't pushing on the train, you see, it's pushing on the ground. Its velocity must be related to the ground because its wheels are getting the reaction necessary to their action from the ground, not from the train. So we have a right to relate the kinetic energy of the automobile primarily to the ground. Now, if you have some special, and good reason, for relating it to the train, such as the possibility of a chase down, you must give the train as the other point of relativity, but only because of the contact. But my point was that a rocket doesn't need any contact with any exterior body. You see, the rocket doesn't push on the earth at all, once it gets free of the atmosphere, while the automobile must always push on the earth. That was the distinction I pointed out.

Those were the only points I was able to gather from his letter. My reason for bringing in the high velocities of the nebulae is, I think, evident from the other letter I wrote. I admit that I didn't complete the argument I suggested in the story, since it is rather technical, but I hoped some of the physicist readers would be able to see it. The idea was that if, at the start, the rocket had a velocity of 15,000 miles per second relative to some distant nebulae and at a later time has accelerated till it's velocity relative to the nebula is 15,001 miles per second, then the work done is  $\frac{1}{2}M(15,001^2 - 15,000^2)$  by the formula for kinetic energy, where  $M$  is the mass of the ship,  $v$  the original 15,000 m.p.h. velocity and  $V$  the later 15,001 m.p.h. velocity. The difference between these two is much greater than the difference between 100<sup>2</sup> and 101<sup>2</sup>, and since I DO have a right to calculate my KE on either basis, it is impossible to my what amount of work I did during the second to which the velocity increased one mile a second relative both to the distant nebulae and some other body which had originally the relative velocity of only 100 m.p.h. I haven't troubled to work that out, but I hope Mr. Kalitzky will be able to see the principle.

I am sure that Mr. Kalitzky didn't seriously raise the objection concerning the nebulae retreat hypothesis. In the first place the item was placed solely as an illustration, a handy one, and the truth or untruth of the hypothesis has no bearing on the truth or untruth of the story, and in the second place I feel I certainly have a right to quote an authority such statements as Meadon and Einstein and James Jeans as a working basis in the work.

But as I said at the beginning, there really is so little reasoned material here to work on, that it is very difficult to give a reasoned, logical answer. An actual physical experiment is, of course, the only proving ground, but that is, at present, impossible to us. We can only argue from physical theory, but hope for a definite answer from practice later.

Of course in setting fire to a forest, you are not doing work, but merely releasing the chemical energy stored in the trees and the oxygen of the air, so that is not really a sound analogy in any way that I can see. The only thing

analogous to that in the story is the release of the energy of the fuel by pushing the ignition button.

Finally, I am sorry Mr. Klotzky did not like the foreword and considered its physics poor. However, from what little you said of him in your letter to me, I gather he is studying physics. Perhaps as he studies further the more complete argument, which I cannot give in the little space available, will be clear to him. Sincerely, Karl van Campen, 331 Massachusetts Avenue, Cambridge, Massachusetts.

### This is on Good Authority

Editor, Brown Topics:

Is it permitted to wonder what four professors of physics were stamped by Mr. van Campen's problem? And what the three brilliant graduates of M. I. T. seriously studied while at that seat of learning? For I very strongly suspect that he is simply trying to pull our collective leg; and, deliberately (I believe) to that end, he has confused work and energy. And, further to confuse us, he has (also deliberately, in my opinion) dressed in relativity in a fashion that is mathematically both absurd and indefensible.

There is no such thing as ever has been, any law as to the conservation of work. If his spaceship were stationary—as it would be if, on the surface of the earth, his thrust of 1,000 pounds were not sufficient to move it—he could burn a million pounds of fuel and expend all its energy without doing any work at all, as far as the ship itself were concerned.

A rigid mathematical analysis of the attraction postulated by Mr. van Campen, (in which he indulges upon diverging gravitational and frictional forces) is as follows:

Mass of spaceship.....	M
Driving Force.....	F
Distance.....	S
Initial velocity.....	V <sub>0</sub>
Final velocity.....	V <sub>1</sub>

From the fundamental law of motion,  $a = dv/dt$ , we obtain  $F = M dv/dt$ . Then, integrating between limits 0 and S for s; and between V<sub>0</sub> and V<sub>1</sub> for v, we obtain

$$FS = MV_1^2 - MV_0^2$$

But the first term of the right-hand side of this equation is the kinetic energy of the spaceship at velocity V<sub>1</sub> and the second term is its kinetic energy at velocity V<sub>0</sub>. Thus it is evident that the work done is rightly equal to the change in kinetic energy of the spaceship, and to nothing else.

And Mr. van Campen will please note that this relationship is and always must remain true, whether the point of reference be taken as Earth, Jupiter, Alpha Centauri, or the most distant nebula in the Universe.—Ira Kramet, II.

### Your Favorites Will Appear

Dear Editor:

Congratulations on publishing *Lo*. Mr. Fort's incomparable collection of after dinner showed me just how terrible a scientific article can be, and lets me fully appreciate the efforts of your other authors. I fully agree with Robert Moe when he says, "Mr. Fort is obviously a poor deluded soul who thinks himself right and the world wrong." Except for Mr. Fort's masterpiece, *Astounding Stories* has never published anything really poor, and now that it has ended, I feel that *Astounding Stories* from now on will publish nothing but interesting material.

There is one thing that I do not like about the construction of the magazine. I'll give you three guesses. The type? Wrong. The illustrations? Wrong again. The cover? Right. Couldn't you possibly use paper on the cover that doesn't crumble when you look at it real hard? Your illustrations are swell, but I

would improve the magazine if all of them were full page.

Please don't go away monthly. If you have so many good stories, publish a quarterly containing three times as many stories as the monthly edition and charge accordingly.

Things I would like to see in your excellent magazine are: *Supplies to Forward To Earth* and *Old Faithful*. Another story by Harry Bates. But most important of all further adventures of *Lothrop Greenham*.

How about more *Williamson*, *Wandrei* and *Peary*?—Oliver C. Davis, Big Pine, California.

### Illustrations Too Dark?

Dear Editor:

Although I had discontinued reading *Astounding Stories* under its previous editors, I found that its standard had above such a marked improvement with its present publishers that I am again a constant reader.

Both in title and other magazines, Brown and David have shown themselves able to produce drawings which are far superior to the work of any other artists in the field except, perhaps, Paul. There is, however, a tendency for certain of the illustrations to be too dark.

Your lineup of authors sounds most impressive, and it only remains for them to concentrate a little more in introducing characterizations and human interest into the few hard spots for science-fiction to become more realistic. This should receive your earnest consideration, as a start from Dr. Smith, some of your authors seem able to breathe life into their tales.

I am twenty years old and would be keen to correspond with any who may be interested.—Jack Thomas, 23 William Street, North Brighton, Melbourne, Australia.

### The SPWSSTFM Reports!

Dear Editor:

Your staple reign over *Astounding Stories* is getting shorter, old chap. Since that last letter appeared, new members have come in droves, adding to contributions by the tale full. Joe Hatch and Iren Ewing, who say they are casual traders on Marx, and give their addresses as 113333 Canal Boulevard, New York Seedy, Marx; wait in their check for \$1000.00, which you know is the legal tender on that planet. For this most gracious gift, they were given points in my Royal Palace, and titled, Royal Canal Traders of the Royal Palace of Bourgeois Traders.

Honorable Earl Lawrence of Daring, Count, suggested a way to remove the staple obsession, but we promptly vetoed it and banished him, for we want *Astounding* to remove the staple, and not us. Willie [illegible], our Chicago member, went on record as being in favor of *Astounding* coming out twice monthly with pocket staples, so that we could eat them. Ted Letwin, Jersey City member, agreed and stated that if *Astounding* would then serve beer with each copy, we would have as thick coming, unless the beer was spiked.

Any one wanting to join the SPWSSTFM, write me at once.—Bob (Portator) Turber, 219 East Grove Street, Bloomington, Illinois.

### Here It Is!

Dear Editor:

I have sworn that I'll write a letter to *Astounding* before the year is out, so here I am.

First, a few comments on the January issue: Frank K. Kelly's stories are well written, but they make a person feel cold and uncomfortable. The cover drawing was too fantastic to suit me, and here's a complaint on last month's cover.—If had nothing to do with *The Nightmist* Harbor.

Green Glory was rotten. Can't Mr. Long write any other kind of story?

**Gold**—Answered with age. In spite of the fact that I don't like serials strung out too long, I was sorry to see the end of *The Skyport Of Valeris* in sight. But that story should have been written under two titles—*Skyport Two* and *The Skyport Of Valeris*.

**Barry**. Odd, but interesting. Marchion's new style of drawing is much better.

Webb's stories always welcome. His stories exceed the "good old days."

**Chapman's** *The Nightingale* is his best so far.

As to the Editor's Page, it shouldn't have been hidden over in the back. It's much better to answer letters that way than a reply for each letter. I like the manner of that statement, but none which we can honestly call a "thought variant." Personally, I think *Amazing* should drop the idea of one in each issue. They've served their purpose and lifted off out of the run.

You asked for everyone's views on going semi-monthly. I'm afraid of it. Even monthly, bad stories creep in. But if you think there's plenty of good material, why go to it. I am especially in favor of a quarterly.

And now, **Brass Tacks**. Mr. Webb's seems to have stirred up a hornet's nest with his suggestions for a wild-and-woolly science-adventure magazine. I believe that a magazine like this would be welcomed by all the fans. Judging from letters, they don't have nearly enough sci. and Street & Smith is surely big enough to publish two. If any one is. I liked Commander John Hanson better than *Have Cartel*.

Lo also seems to have aroused controversy. It was so loosely put together that it was a strain to read it, yet I finally finished. As I see it, *Fort* conceived a lot of things, but proved nothing. If he were able to-day, I would like to have an explanation of weaknesses that move in orderly paths. Nevertheless, while reading it, I almost believed that there was a lead of the sky.

I can't see why everyone abuses the old *Amazing* so. I enjoyed it, what chance I could get, right up to the last.

I wonder if it was just a coincidence that you put the report of the *SPWSTFM* alongside point three in Mr. Abner's amazing letter relating to "wire snapper" fiction.

In other sci. magazines there seem to be informal contests running for the honor of youngest reader. Once I might have entered my name on the roll, having started at the tender age of six years, but now—was it me—I'm fourteen!—Jack Spier, Comanche, Oklahoma.

### The Anonymous Booster?

Dear Editor:

Here's my opinion, for what it may be worth. When, so and if your magazine goes bi-monthly, I cease buying it—and I am a regular customer.—Citizen CH-133-2.

### We Thought It Was Nice!

Dear Editor:

I've no need to Brass Tacks a great many letters asking you to publish your magazine twice a month. I do not agree with these letters. You say you have a great many good stories at the present time, but, while that is without doubt, true, publishing a magazine twice a month is much harder than publishing a monthly. It is possible that you might run out of good material some time, you know.

I have been glad to see your steady improvement since October, 1933, and I have saved every issue since that date. Please, please, have Donald Wandrei write a sequel to *Parasol* for Earth. After following Web Combs's adventures through one million years, I'd certainly

like to know if they (Web and Ellays) reach *Green Major*.

*Amazing* is certainly selling well here. I had to go to three stores before I found that *Amazing* January cover, peaking up at me from the newsstand. The covers from June on were so good, too—Ours to come out with that lesson! I ask you, Mr. Editor, is that nice?

As to the contents, though, I must say that you were generous, at the very least. Seven complete stories and three two serials, too. Earl Vincent is a marvelous author. *Barry*, by H. V., was really good. Say, maybe you didn't notice this, but you have Earl Schickler's name on the cover and no story by him on the inside. What the heck? One *The Killer* each issue? *Green Glory* and *Silver Ship* noticeable were not so hot. But *Night On Tides* was swell.

Don't you think it would be nice to have a Quarterly? But NO twice monthly, please! What's happened to Murray Leinster? WE WANT LEINSTER!

Best wishes to a paper mag—Betty Morgan, Detroit, Michigan.

### He Didn't Like "Lo"!

Dear Editor:

I have to hand it to you. You have certainly made a big improvement in *Amazing* stories in twelve months. When I saw the December, 1933, issue of the new *Amazing* I thought it was pretty terrible, but the December, 1934, issue—what a change!

I see you hint at giving us a twice-a-month magazine soon. I am entirely in favor of this idea, but I think there are one or two other little matters to be attended to first. The most important of these is: Give us John Hanson and *Have Cartel*. Some one has said that your stories lack outstanding characters. If you give us this famous pair, that defect would be remedied. I would also like to see Murray Leinster continue his Fifth Dimension Series.

Another thing that displeases me is the advertisements at the ends of some stories. Eliminate those, please. They spoil the look of the magazine.

A minor point is: smooth edges. Could you not at least have the cover trimmed so that it will not get ragged around the edges?

Your illustrations are all that could be desired. H. V. Brown is very good on covers, but he should not be allowed inside the book. Marchion is good for certain types of drawing, and Ed is practically infallible. His work is very reminiscent of Weston's, but, I think, a little better.

*The Skyport Of Valeris* is a swell story, and *The Nightingale* Machine starts out pretty good. But I think that one month is enough to overlap serials. I was very happy when *Lo* finished, for it took up a lot of valuable space. I never read anything quite so foolish and incoherent as this. Mr. Fort may have spent years collecting the data, but he would have been better off cutting out paper dolls.—J. J. Johnston, Mowbray, Manitoba, Canada.

### Quarterly?

Dear Editor:

I'm with you full force—and hope you go "twice a month." There is little enough good science-fiction as it is—and if you believe you can uphold or improve your standard by going "twice a month"—then LET'S GO.

Also, if you possibly can, bring out a large size 30 ct. QUARTERLY—PLEASE, and if not a quarterly, then an ANNUAL or SEMI-ANNUAL.

The more the better—and I think you can be assured that all the true fans will stand behind you.—Lewis F. Terrance, First Class Member 168—SFL, Winfield, Kansas.



### The Air is Willing!

Dear Editor:

I've been reading science-fiction for a number of years (since the age of about 7) and I'm now going on 16, but this is the first time I've written in. I want to make a plea in favor of hearing Astounding on the air, as I've noticed that there are about three Street & Smith magazines on the air already, and I'd like to know why not Astounding Stories, which in my opinion is more entertaining, educational and has greater variety than those other S & S magazines.—A. F. Schindler, Jr., 546 East 163rd Street, Bronx, New York.

### Thank You!

Dear Editor:

Congratulations! Astounding Stories is the ray in the disintegrator, juke in the autumn, etc.

Due to Astounding Stories there is again a chance for the science-fiction fan to rejoice. Your magazine has revived the field of science-fiction.

There are several other magazines on sale, and at one time, in my estimation, one of these magazines had a monopoly on the science-fiction fan, but we're in the air fan. The time came when all magazines dropped to the lowest possible standard. In fact, Astounding Stories was taken out of print.

Then, a ray of sunshine appeared. Lo! and behold! Astounding Stories was back, back bigger and better. Really, my enthusiasm is running away with me. Astounding Stories is simply swell.

I've noticed various readers asking where they can purchase copies of back number issues. It so happens that I have quite a few back number issues of Astounding Stories, and also some Amazing Stories that I'll be glad to sell below cost. If anybody is interested, please write to me and I'll be glad to answer.

In my estimation, Schachner and Williamson are your best authors. Howard Brown's cover on the January, 1934, issue is the finest cover I've ever seen on any magazine. Without doubt Dr. Smith writes the greatest serials ever to be printed. His *Skyport Of Valmore* is another masterpiece.

I'd be glad to see Schachner and Williamson next month, and get Dr. Smith to turn out another *Skyport* story soon.—Frank Egan, 15 North Maple Parkway, New York City.

### More about "Twilight"

Dear Editor:

This is to ask for a sequel to one of the most fascinating stories for its length that you have published yet—*Twilight*, when may we have one? That story was entirely too good and with entirely too much promise of a sequel for me to wait much longer. If Don Stuart doesn't come across in grand style, we are certainly going to have to beg him alive, or something equally dreadful. How about it?

And, incidentally, why more acclaim from the readers for Raymond Z. Gallun? Old *Faithful* was one of the very best stories of the extra-terrestrial life and inter-planetary communication ever written. And I remember *Space Pilot* as the greatest short-short you ever have published. More Gallun! His writing has a depth and quality that place him at the top of the heap.

Please don't print any more "heavy water" stories. There are too chemists and those physicists in my immediate family and frankly consider the subject of heavier too old a one for me to get all hot and bothered about nothing. Especially one which has passed the witty absurd theories that so many over-published "scientists" have advanced. I'll drink

any amount of it. Don't get me wrong, though. But Schachner is one of my favorites except that he should study business men and see how little they really differ from the original mixture of imagines. He should meet of the men working on it. It has already had too much publicity.

Yours for a quarterly, a semi-monthly, a fantasy magazine, a *William's "Pioneer"*.—Ramon F. Alvarez-del Ray, 1916 Massachusetts Avenue, N. W., Washington D. C.

### We're going slowly

Dear Editor:

I don't think it advisable to change Astounding Stories to two per month unless you can keep up your present standard which I believe is very good at the present. Too many times readers rush and your stories and lose in the long run.

Have read Astounding Stories for years and have enjoyed them, and believe your magazine better than *"Wonder"* and others. How about something like *The Skyport Of Valmore*—very good.—William Kibby, New American Hotel, Franklin, Massachusetts.

### Thank you!

Dear Editor:

Although I have read your magazine for six years, I have never written a letter to you. Your magazine has time in an astoundingly short time from the word to the best in science-fiction. Since Street & Smith have taken it over there has been a quite noticeable improvement in the science-fiction field. Many newspapers and magazines are publishing science-fiction stories of the more conservative type, and it is now beginning to be recognized as literature. The great numbers of people who are becoming and will become interested in science-fiction have not grown with the magazine. They will be unable to understand and appreciate the highly scientific stories that you print and many may turn away. If you will publish another magazine with a more conservative cover and name, I am sure you will greatly increase the circulation of Astounding Stories and interest more people in science-fiction. In such a magazine you could print humorous stories, adventures and less technical types. Thus you will interest the more conservative reader.

As to making Astounding a semi-monthly—I think you should try to improve on what you have. Not all of your stories are excellent. Until that time comes, and it ultimately will, I do not believe that you should attempt a semi-monthly.

Whatever you do, however, you may rest assured that any increase in the amount of science-fiction available will be joyfully acclaimed by your audience. WE ARE WITH YOU!—Ovid Baker, Garland, Texas.

### The SPWSSTFM Again!

Dear Editor:

Just finished the January issue of Astounding Stories. *Star Ship* formidable was below par as a complete novel. Maybe I'm not bright, but I couldn't get any sense out of it. *Flight On Time* was splendid. The two best short stories were *Gold* and *Scorpy*.

Each of the serials are getting along swell. *The Skyport Of Valmore*, part six, was a considerable improvement over part five. *Space Tachs* is really the best part of the magazine. I notice that our friends Messrs. Ackmann, Duggow and Tucker have letters published in this issue which make it triply interesting.

By the way, tell Mr. Tucker that I am sending him a can of half-smoked cigarettes as my

contribution to his famous *SPHISTYM*. Also ask him what that makes me.—Robert H. Aaglin, 232 Jefferson Street, Danville, Virginia.

### Weinbaum is scheduled.

Dear Editor:

Carrying out a resolution made for the new year to come, I am writing you to tell you how much I have enjoyed *ASTOUNDING STORIES*. Your January number is exceptionally good. Your best story is *Flight On Tides*. I would really like to read some more stories by Weinbaum. *Green Glory*, by Frank Long, is also enjoyable, and I should like to read some more of his stories. Campbell's *Gold* was good but was somewhat spoiled by the weak ending. Looking forward to the next issue.—Robert H. Friend, 503 Stratford Place, Chicago, Illinois.

### Bored by "Lo"!

Dear Editor:

I am writing my first letter to a magazine. I am heartily in favor of *ASTOUNDING STORIES* becoming a bi-monthly because I am very much against serials in a monthly, but mostly because I enjoy this type of story very much and find one issue a month insufficient to satisfy my appetite for them.

Since I have started a letter I might as well tell you something about the type of stories I enjoy most. I am a very easily satisfied reader, and the only thing I have not liked in the magazine during the past year has been *Lo*! As a matter of fact I was very bored by it, and only read it because my roommate did and he wanted to discuss it—with the accent on the "rue." As an engineering student I get plenty of facts every day and only read *ASTOUNDING* for entertainment. Consequently I do not care if the authors go contrary to all present scientific thought and evidence. I don't pay any attention to that part of the story, anyhow. Although the novel ideas brought out in some of the stories have caused much heated debate. So long as you give us plenty of entertainment and action, you are assured of at least two readers.—Armand E. Larwa, 927 Gladys Street, Flint, Michigan.

### I agree. I won't.

Dear Editor:

Having rediscovered our mag. a few months ago I find it vastly improved and on top of the heap. And you had the courage to publish *Lo*! So far everything is to your credit. But I see a tendency to slip into the same error your competitors have fallen.

It seems to be the general policy of "Scientific" magazines to limit their stories, with very few exceptions, to the mechanistic type of imaginative stories in spite of the claim: "Fiction to-day, reality to-morrow." But let's examine the record, the utterances of the foremost scientists, the Masters of Science, on this subject.

Edison, in his latter years, is quite probable that the most valuable advances of the future will be in discoveries about Man and the depths of his mind, his extension in the universe. Oliver Lodge, Steinmetz, Flammarion, Lord Kelvin and numerous others all expressed their belief that physical man and the physical universe are a minor part of a vaster universe and that the most important discoveries, in their value to mankind, will be made in the so-called "occult" realms of the unknown. Also, that research along these lines will also bring more rapid advance in purely physical science. But so much for the future. About the past:

There are a large number of independent thinkers which maintain that humanity has a much greater past than generally assumed or conceded by organized science. The stories of past and gone civilizations, greater than ours

to-day in material science, are too persistent and widely spread to be dismissed with a "Gossamer" or "Old woman's tale." Also, during the last fifty years so much proof has been found on all continents that classic archeology is bound to receive some shocks in the near future. It only needs an Einstein with the courage to assemble the facts and proclaim them openly.

So, dear Ed., don't chuck all the stories dealing with these subjects into the ashcan. The future will acclaim you as a pioneer having vision. All the readers want are well-written stories having a scientific basis. The "blood and thunder" kind of stories are unsatisfactory to every humanity that shows its science, as well as every individual, succeeds only in destroying itself.

Here is to a prosperous New Year to you and *ASTOUNDING*—Frederick G. Behr, Bayville, Long Island.

### Were they better?

Dear Sir:

I know that Street & Smith have been going in for quantity production in the magazine field, but I think *ASTOUNDING STORIES* should not be printed twice a month or cheapened in any way. The saturation point would be reached sooner or later, and then what?

Other science-fiction magazines at one time were better than *ASTOUNDING STORIES* is now, but at present I think it is the best in the field. Nevertheless, there is much room for improvement. Yours very truly,—A. W. Benson, 1644 24th Avenue North, Minneapolis, Minnesota.

### Fort Dixey?

Editor, *ASTOUNDING STORIES*:

All this afternoon I've been working on a problem that involves taking cube root to three decimal places, so being in a highly ungrateful frame of mind I'm trying to come out of it by writing this letter. It's my first to *ASTOUNDING*, although I have a copy of almost every issue that has been published.

First of all, I've been following the references to *Fort Lo*. Too bad it ended with a question mark—almost about the "star shell," or others—but it was immensely interesting. Of course a hackneyed critic always can tell exactly how everything should be done, but I really believe that if Mr. Fort had made his language a little more direct a lot of us would have enjoyed the serial more. Honestly, I got dizzy in some of his paragraphs! How about some more of his findings, without the roundaboutness his first two or three installments showed?

*Exploit Of Valerian* is turning out all right after all. I guess I'm just more interested in *Boston's* adventures than I am in the leaders' of Valerian, and I'm sorry to see that next issue completes the present story. Here's hoping the *Seasons* and *Crusade* will appear again.

Lastly (for the present), it is remarkable the way science-fiction has developed into a more or less definite field, with its own theories and accepted methods—and was to him who tries to upset 'em unless he's good! This in spite of the fact that most of the happenings are entirely imaginary, too. Besides, all the magazines in the field appear to be linked into a group, competitive, but still a group as no other magazine field seems at present. The same names appear in the readers' columns of all; and it speaks mighty well for *ASTOUNDING* that this magazine has caused an upturn in quality throughout the whole field! More power to the editor in his efforts, and meanwhile my shelf will continue to grow; I'll be glad when it grows twice as fast (when you publish twice a month). Incidentally I think "The Flanster" is a great idea, and (look out Dillbert and Darrow) if he's as good as Doc Savage he'll be a honey.—Gerald H. Adams, Wiley College, Marshall, Texas.

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